Bulletins, from January 4, 1909 to April 12, 1909

ASSOCIATION'S COPY

BULLETINS OF THE Aerial Experiment Association

1

Bulletin No. XXVI Issued MONDAY, Jan. 4, 1908

ASSOCIATION COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell AssistantEditor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO.XXVI ISSUED MONDAY JAN. 4, 1908.

Beinn Bhreagh, Near Baddeck, Nova Scotia .

TABLE OF CONTENTS.

ILLUSTRATIONS .

1

EDITORIAL NOTES AND COMMENTS .

Langley Medal and Tablet .

December 26, 1908: — I have just returned to Beinn Bhreagh after a visit to Washington, D.C., and Hammondsport, N.Y. I left Beinn Bhreagh December 11, and returned December 25 in time for Christmas dinner.

On December 15, I attended a meeting of the Regents of the Smithsonian Institution in Washington.

Secretary Walcott read a letter he had received from me which reads as follows:—

Beinn Bhreagh Dec. 5, 1908: — The Wright Brothers are being deservedly honored in Europe. Cannot America do anything for them? Why should not the Smithsonian Institution give a Langley Medal to encourage Aviation?

(Signed) Alexander Graham Bell.

Secretary Walcott seconded the suggestion which met with the unanimous approval of the Board of Regents, and Senator Cullom moved the following resolution which was adopted:—

" RESOLVED: — That the Board of Regents of the Smithsonian Institution establish a medal to be known as the Langley Medal, to be awarded for specially meritorious investigations in connection with the Science of Aerodromics and its application to Aviation".

Senator Cabot Lodge then moved the following resolution which was adopted:—

" RESOLVED: — That the Secretary of the Smithsonian Institution be requested to report to the Board of Regents as soon as practicable upon the erection in the Institution Building of a Tablet to the memory of Secretary Langley, setting forth his services in connection with the subject of Aerial Navigation". A.G.B.

2

AERO CLUB MEDAL .

December 26, 1908: — On December 16, I visited President Roosevelt at the White House as a member of the Committee on Medals of the Aero Club of America. The delegation was a large one under the leadership of the Hon. Mr. Parsons, a member of the House of Representatives.

The delegation explained to the President that the Aero Club of America proposed to give a medal to the Wright Brothers at a banquet to be held in New York as soon as the Wright Brothers return from Europe. The object of the conference was to invite President Roosevelt to attend the banquet and present the medal.

President Roosevelt made an eloquent address in response to the invitation of the Committee showing thorough appreciation of the great work accomplished by the Wright

Brothers, and his desire, as head of the Nation, to bestow the medal upon them. He regretted, however, that it would be impossible for him to attend a banquet in New York and proposed an alternative plan.

He suggested that the medal should be given in the White House and he placed the Blue Room of the White House at the disposal of the Committee to accommodate a meeting of persons interested in Aerial Locomotion.

The invitation of the President has been accepted by the Aero Club but the date has not yet been fixed. A.G.B.

3

PATENT MATTERS .

December 26, 1908: — On Dec. 16, Mr. Cameron of the firm of Mauro, Cameron, Lewis & Massie, spent the evening with me at my house in Washington and we went over very carefully the specification he has prepared for a patent upon the Hammondsport work. We found that the difficulty regarding the use of the word aeroplane as applied to a concavo-convex surface could be very easily gotten over by omitting the word aeroplane wherever it occurs and substituting “supporting surface”.

I suggested to Mr. Cameron that a broad claim might be added covering a unique feature of the truss employed in the Hammondsport machines. The vertical compression members (of fish-shaped cross section) have considerable extension in the fore and aft direction, but are very thin in the lateral direction in order to reduce head resistance and weight as much as possible. In order to prevent lateral deflection they are supported by tension members in the form of tie wires.

Mr. Baldwin thinks that this is a unique feature in trusses, and I agree with him in believing that it will become a necessary feature in aerodrome trussing. In bridge trusses and in fact in trusses of all sorts not intended for aerial work compression members, thin in their la a t eral cross section, strengthened by tension members in the form of tie wires, do not seem to possess much advantage and the plan seems universally to have been adopted of strengthening the 4 compression members by making them thick enough to resist deflecting strains. In aerodrome t ?? r? ssing, on the other hand, compression members thick in lateral cross section, are undesirable because such thickening adds weight and increases head resistance. The plan adopted in the Hammondsport machines gives the necessary strength to resist deflection without material increase of weight or head resistance. For this reason such a construction will appear as an element in all the flying machines of the future, and if a claim for this element is sustained by the Patent Office it would render our patent of great value.

I have therefore suggested the insertion of a claim somewhat as follows:—

In a flying machine, a truss containing compression members supported against lateral deflection by tension members in the form of tie wires, or

The combination of a compression member witha tension member to resist deflection.

The suggested claim may not, perhaps, be in proper form but Mr. Cameron now has the idea and approves of it and will put it in proper shape for submission to the Patent Office. A.G.B.

5

VISIT TO HAMMONDSPORT .

December 28, 1908: — I spent Sunday and Monday (Dec. 20 & 21) at Hammondsport, N.Y., and examined with interest our Drome ? N o. 4, McCurdy's Silver-Dart, and our Drome No. 3, Curtiss' June Bug, placed upon floats and renamed the Loon.

On Sunday, Dec. 20, three gentlemen from a distance appeared in Hammondsport to witness any experiments that might be made for my benefit. These were Mr. Means of

Boston, the Editor of the Aeronautical Annual; Mr. E.L. Jones, Editor of Aeronautics; and Mr. Kimball, the Secretary of the Aeronautical Society of New York.

Drome No. 4, McCurdy's Silver-Dart, is certainly a beautiful machine entitled to the highest commendation. The new engine looks most efficient. We went out to the race track on Sunday afternoon to try the Silver-Dart although there was rather more wind than was desirable and the weather was very cold. The tent in which the machine had been housed had been taken down and a wooden building, almost completed, had been substituted. This had been done on account of the high winds that had prevailed which threatened to wreck the tent and incidentally, the machine. The wisdom of th r e wooden building was made manifest by occasional gusts of wind striking the tent cloth that covered the open side of the unfinished building with such force as to show that there would have been great danger of injury to the machine in an unprotected tent.

While these squalls lasted it was impossibl , e , of course, to take the machine out into the open. We utilized 6 our time by testing the engine and propeller. The engine seemed to work perfectly and the impression left upon the mind was that Curtiss and McCurdy had now at their command abundant power for every purpose, but subsequent experiments seem to indicate that this may not be so.

About sundown on Sunday, Dec. 20, the wind died down sufficiently to enable experiments to be made. There was still, however, a breeze of I should think about 6 miles an hour blowing down the valley towards Lake Keuka. On account of the limited space available for manoeuvres in the valley higher up than the race track, it was not considered advisable to attempt flying the machine against the wind in that direction. The attempt was therefore made to go with the wind down the valley towards Lake Keuka. The engine and propeller seemed to work well and the machine made a fine run on the ground, but when McCurdy elevated the front controls the machine only rose sufficiently to clear the raised side of the track and immediately came down in the field beyond running some distance over the snow before the engine was stopped.

Three attempts were made with similar results and further experiments had to be postponed to another day.

Poor Douglas McCurdy was much mortified at the behavior of his aerodrome in the presence of distinguished visitors, especially so because the machine, a few days before had flown beautifully a distance of about a mile. On that occasion, however, the wind had been blowing up the valley from the Lake. The machine was well supported when flying 7 against the wind, but came down when he made a turn and attempted to go back to his starting point with the wind.

I think the result indicates that the velocity attained is not sufficiently great for the support of so heavy a machine, so that if its velocity, relatively to the air, is reduced by 5 or 6 miles by a wind blowing in the direction of the machine's motion, it is not supported in the air; whereas if the relative velocity is increased by 5 or 6 miles by a wind blowing against the machine it flies well.

What is needed, I think, is plenty of superfluous power to make up for changing air conditions, and this means greater power in the engine, or less weight in the machine. It is somewhat noteworthy that the continuous process of evolution at Hammondsport has resulted in greater and greater flying weight in the machines until, in the Silver-Dart, as at present equipped, we have little, if any, superfluous power, so that a slight wind blowing with the machine robs it of support.

Curtiss and McCurdy thought that greater propelling power would be obtained with a new propeller they had on hand. This was installed on the Silver-Dart on Monday, Dec. 21, but weather conditions, De pr evented any trial of the machine on that day before I left, and I have not heard of greater success having been attained since. In my opinion the trouble lies in the engine and not the machine. The engine is too heavy for that machine. I am also inclined to think that the center of gravity is too far forward for safety in the event of the loss of headway. The machine itself is beautifully 8 constructed and I have no doubt that with a lighter engine or a considerable increase in propelling power, and with the center of gravity placed somewhat further back the Silver-Dart will prove to be the finest flying machine ever constructed.

I was much interested in seeing the Loon although no opport i u nity presented itself for a trial during my stay in Hammondsport.

I was somewhat surprised that the Loon, in former experiments, failed to rise from the water without hydro-surfaces for it seems to have made a speed of about 23 miles an hour. After seeing the floats, however, I can well understand the failure to rise, for they are triangular in cross section and placed flat side down. Imagine a boat with a flat deck placed upside down in the water so that instead of resting upon its keel it floats deck side down. I can well imagine that under such circumstances the suction of the water, when the machine is going 20 miles an hour or more, would be sufficiently great to prevent rising into the air.

The hydro-surfaces now fitted below the catamaran structure appear enormous as compared to those used in Baldwin's experiments here. They are beautifully made, of wood, and present the curved surface that has proved so successful here. The submerged surfaces, however, judging from our experiments here are much too large, presenting probably more than ten times the surface used by Baldwin. I have not yet heard what results have been obtained with them in Hammondsport. A.G.B.

9

IMPORTANT CONFERENCE AT HAMMONDSPORT .

December 29, 1908: — On Sunday evening (Dec. 20) the following persons were assembled in my room at the Hammondsport Hotel:— Messrs. Curtiss, McCurdy, Means, Jones, Kimball and myself. Of course we talked of flying machines, dirigible balloons, aerodromes, aeroplanes etc. etc.

One subject on which we all seemed to agree was that the terminology of Aeronautics required revision, and especially that the word aeroplane, as the name of a machine which had no plane surfaces in it, was inappropriate and incorrect. Discussion developed the point that there was much less objection to the word aerodrome that I had supposed and Mr. Jones suggested the adoption of the term as a designation for heavier-than-air machines generally, including the so-called aeroplanes, helicopters and ornithopters.

It is probable that this little conference at Hammondsport may lead to important results. Mr. Jones proposed that if we could all agree upon a suitable term n i nology he would adopt it in his journal “Aeronautics”, and Mr. Means gave the impression that he too might adopt it in further issues of the Aeronautical Annual.

I expressed the opinion that Langley, the introducer of the word “ae or ro drome” limited the term to the class of flying machines now commonly spoken of as aeroplanes; and expressed a doubt as to whether the etymology of the word would render it applicable to helicopters and ornithopters. We tried to find a dictionary in Hammondsport that should 10 define its meaning but the word was not contained in any dictionary accessible to us. I asked Mr. Jones to hunt the word up in the Standard Dictionary and let me know how it was defined as I had the impression that the dictionary limited the term to machines supported by gliding flight.

I had always had the idea that the word “aerodrome” had been coined by Langley by compounding together two Greek words aero (air) and dromos (“a course, race, running; flight; a fleeing; escape)”. The word “dromos” being derived from “dramein” the infinitive of a verb meaning “to run”, “to move quickly”; it is obvious that the root meaning of “aerodrome” is “air runner”.

I find, upon examination, that I was mistaken in supposing that the word “ae or ro drome” originated with Langley. The Smithsonian correspondence has revealed the fact that Prof.

Langley correspond with Prof. B.L. Gildersleeve, the distinguished Professor of Greek at Johns Hopkins University concerning a suitable name for his machine.

In a letter to Prof. Langley, dated, Oct. 30, 1890, Prof. Gildersleeve says:—

“The word you want is made to your hand in aerodrome (aero-dromos) “air runner”. *** No one will have anything to say against a Greek word that is found in the Lexicon”.

Again under date, November 4, 1890, Prof. Gildersleeve says:—

“To my mind” -drome” connotes swiftness, as the “dromedary”, is the “swift camel”. The main thing is to get a word of fairly classic formation, fairly suggestive (not exhaustive) of the thing, and wholly easy of pronunciation. Modern Scientific nomenclature is based on definition. 11 Hence the awkwardness to begin with, and the inadequacy to end with.

It thus appears that the word “aerodrome” was suggested by Prof. Gildersleeve and adopted by Prof. Langley. It is not a new word artificially compounded from “aero” and “dromos”, but is an old word in actual use by the Greeks and to be found in every Lexicon. Everyone, therefore can get the proper definition for himself by consulting a Greek Dictionary. I have just examined a Greek Lexicon and find the following two words bearing upon the subject:—

Aerodromeo , “to traverse air”.

Aerodromos , “traversing air”.

These are the meanings of the words as used by the Greeks; and I have therefore written to Mr. Jones that there appears to me to be no impropriety in extending our meaning of “aerodrome” to cover all flying machines of the heavier-than-air type as he suggested or even to include dirigible balloons. In fact th r e word “aerodromics” might, consistently with its Greek meaning replace the word, “aeronautics” itself, so as to cover the whole field; and such a word would be more appropriate than aeronautics, for balloons and flying machines are not analogous in any respect to ships and they all “traverse the air”. A.G.B.

12

The Launching of the Query .

December 31, 1908: — Baldwin's new hydrodrome was launched to-day. Mrs. Baldwin stretched out her arm in dramatic fashion over the bow of the boat as the men were about to put it into the water and exclaimed, “I name thee the Query”. The name will be painted on the bow and the stern will bear an interrogation mark (?). Not attempt was made to try the “Query”, and we were satisfied with launching her as the final act of the Laboratory for the year 1908. (for photographs of this boat see Bulletin XXII p. 31, XXIV p. 47 and a photograph in this Bulletin). A.G.B.

13

LETTERS FROM MEMBERS .

Curtiss to Bell .

To A.G. Bell, Washington, D.C.

Hammondsport, N.Y., Dec. 16, 1908: — Your message was not received last night in time to get the patent papers away. We are sending them this morning, they should reach you tomorrow morning.

May we expect you here within the next few days? If not, shall we see you in New York on your way back? We hope you will find it possible to come here. I think we can make experiments with both machines while you are here. The “Silver-Dart” will be ready again to-day with its new 8 ½ foot pitch propeller.

The experiments have shown that there is as much slip with an 8 foot propeller as with a 6, notwithstanding the double area covered by the blades. Although we have much more propeller push we do not seem to have the necessary speed and have, therefore, increased the pitch of the propeller. Full description and photographs of trials to date have been sent for the Bulletin.

We are fitting hydroplanes on the pontoons so as to give this another trial when we are through with the "Dart". The weather here is very good, and I hope you will find it possible to come up. The train, you know, leaves at 7.05 P.M. and we can meet you at Elmira.

(Signed) G.H. Curtiss.

14

McCurdy to Mrs. Bell .

To Mrs. A.G. Bell, Baddeck, N.S.

Hammondsport, N.Y., Dec. 17, 1908: — ***This morning as we have already telegraph you (and received your very nice reply) we had a try out, with a new propeller of much greater pitch, giving even at reduced revolutions (668 per minute) a greater pitch speed than we had before. The first flight was great. The balance is so good, and the controls all work so well that it is a pleasure to sit in the machine every minute of the time you are flying. She leaves the ground after traveling 150 feet exactly at the moment you want it to. She seems so light and buoyant. I did so wish that you and Mr. Bell could have been here. She flew down across the old potato patch and then I shut her off because we wanted to look things over before trying a longer flight. Everything was O.K., so we ran her back under her own power and started again this time with the intention of making a turn. I bungled it however, and just as the turn was completed the starboard wing touched the ground and the machine spun round and broke the wheels. The breakes,however, are things than can be repaired in an hour, and so in the afternoon all the substitute wheels and sheets were prepared and to-morrow morning we will try again. I think we will be more successful. It is snowing hard at present; there is about two inches of snow. I don't think however, that this will affect our starting.

(Signed) J.A.D. McCurdy.

15

Curtiss to Mrs. Bell .

To Mrs. A.G. Bell, Baddeck, N.S.

Hammond ? s port, N.Y., Dec. 17, 1908: — ***The two flights John made were very good indeed. The first landing was voluntary on account of a new fence which we did not want to bring the machine back over. In the second trial John attempted too short a turn and was forced to land, striking one of the wings and breaking the wheels.

A great deal of time has slipped by with seemingly not much accomplished of late. I must say, however, that nothing has interfered with the work of the Association. The entire shop has been at its disposal, and everything else has been put aside when necessary to get work out for the flying machines.

(Signed) G.H. Curtiss.

16

McCurdy to Mrs. Bell .

To Mrs. A.G. Bell, Baddeck, N.S.

Hammondsport, N.Y., Dec. 19, 1908 :— The wind blew so hard yesterday that the machine was threatened, and in fact the tent was torn from the ridge pole right down to the side in several places. It is getting so late in the season now that the weather cannot be relied on, and to eliminate all chance of losing the machine, as far as wind and snow are concerned, we have decided to put up a shed right by the tent in which to house the machine. Mr. Harry Champlin has very kindly consented to allow us to do this. The work is busily going ahead at the present. ? E ven if we do not fly any more this year the shed will always come in as useful and even in the Spring and Summer will be much better than a tent.

Just received a note from Mr. James Means, in which he wished to know if he and his friend Prof. Lawrence Rotch could come to Hammondsport and see the experiments. I have wired him to come by all means, and it will be especially nice for him to come now as Mr. Bell will be here.

(Signed) J.A.D. McCurdy.

17

Curtiss to Mrs. Bell .

To Mrs. A.G. Bell, Baddeck, N.S.

Hammondsport, N.Y., Dec. 22, 1908: — *** Mr. Bell left yesterday after a day's stay. We had a most profitable and interesting time. Mr. Means, Editor of the Aeronautical Annual, Mr. Jones, Editor of Aeronautics and Mr. Kimball of helicopter fame, were her. We did not get off very good flights. I will write a little later about that, we may do something yet today.

To-morrow we shall start crating the “Silver-Dart” for shipment to Baddeck. The engi en ne will follow as soon as the “Loon” with its hydroplanes are tried and some shop tests made which, however, will not take long. I am sorry we could not have finished up and gone back with Mr. Bell. We should have liked very much to have been with you during the holidays. Wishing you a merry Christmas, I am

(Signed) G.H. Curtiss.

18

TRIAL OF SILVER-DART THE ACCIDENT.

BACK TO THE

19

BRAKE TESTS: By F.W. Baldwin.

Reali z s ing that we were not getting uniform results from the engine used on the Dhonnas Beag, we decided to put a brake on it to get some indication of the power which was being developed under the ordinary conditions we were dealing with. The bore of the Curtiss No. 2 is 3 ¼ in., stroke 3 ½. Judging from the capacity of this engine, and applying emperical formulae ordinarily used in Marine engines, this engine should develop about 12 H.P. at 1200 revolutions per minute. While the engine may develop more power at higher speed we rarely get more than 1200 rpm in the course of ordinary experiments so that we thought it might be advisable to get some idea of the power ordinarily at our command.

Explanation .

B.H.P. = ft. lbs. per minute divided by 33000 = rpm × P × circumference divided by 33000 = rpm × P divided by 1000 when circumference equal 33 ft. and P equal the pull of the Spring Balance + or - the weight of the Brake Arm. Brake Arm equal 5 ¼ ft.

A Brake was made with above length of arm and attached to the spoked fly-wheel already fitted to the engine.

On Thursday, December 24 we attempted to get some readings but found the spoked fly-w j h eel not suitable for the purpose being by no means an accurate circle. The scale fluctuated so greatly that very little reliance can be placed on the following figures.

In the table:— R is the number of rotations in 10 seconds, P is the pull on the Spring Balance minus or plus 20 2 the weight of the arm. Rpm equals revolutions per minute, and H.P. is Hor r s e Power.

10 secs. R P RPM HP 300 4 1800 7.20 280 5 1680 8.40 200 6 1200 7.20

N.B. Load could not be accurately adjusted. Engine speed variable.

As these readings could not be relied upon we put on another fly-wheel, 14 in. in diameter, which belonged to a small steam engine. This was bolted on to a flange at the other end of the crank shaft giving the engine two fly-wheels.

The results with this arrangement were very much more reliable and I think give a true indication of the power developed. It is only fair to say that the engine was not properly tuned up during any of these tests although all the cylinders were firing when the readings were taken.

10 secs. R P RPM HP 210 5.5 1260 6.7 Monday Dec. 28 165 8.0 980 7.84 200 6.0 1200 7.2

N.B. During these tests the engine was hard to start and would not take an advanced spark.

On Tuesday, December 29 we replaced the non-vibrating by a vibrating coil. Found the engine started more easily and got the following results.

21 22 3 10 secs. R P RPM HP. 180 10 1080 10.80 155 11 930 10.23 100 12 600 7.20 180 8.5 1080 9.18 210 7.0 1260 8.82

Although engine was only run for perhaps a minute at a time and given three to five minutes rest between readings the H.P. fell off ver rapidly. We tried engine unloaded and only got 1440 Rpm, so concluded that although mixture seemed all right, engine was working so badly that further brake tests would be useless. F.W. E B .

Telegram .

Bell to Curtiss .

Baddeck, N.S. Dec. 31, 1908 :— Baldwin's new hydrodrome launched to-day, and named the "Query". Happy New Year to all. Want you here.

(Signed) Graham Bell.

23 24

Gen. Allen to Bell .

To A.G. Bell, Washington, D.C.

War Department, Washington, D.C., Dec. 17, 1908 :— A telegram has just been received at this office from Mr. J.A.D. McCurdy, Secretary of the Aerial Experiment Association, informing us of two successful flights of the "Silver-Dart" to-day, one of them extending one mile and three-quarters.

Permit me to extend congratulations on this important achievement, and I regret that, due to pressure of public business just a t s present, it is not possible to have an officer of the Signal Corps present during these tests.

(Signed) James Allen Brigadier General, Chief Signal Officer of the Army.

25

Morrell to Bell .

To A.G. Bell, Washington, D.C.

Aero Club of America, New York, Dece. 23, 1908 :— The Committee on Medals, Aero Club of America, extends to you its appreciation and thanks for the courtesies extended by you to Mr. D.J. McComb of the Committee while in Washington, a few days ago. The Aero Club of America believes Congress should by appropriate resolutions extend the thanks of the Nation to Wilbur and to Orville Wright and also present them with gold medals. Congress did this for Cyrus Field, and the Wrights have contributed as much to the progress of civilization as did Mr. Field, great as was his services.

At the reception and presentation in the East Room of the White House by the President the Aero Club would like to have represented the Army and the Navy. It would like to have the diplomatic corps present etc. etc.

I have laid the matter of Congress giving the thanks of the Nation and striking gold medals to the Wrights before Congressman Parsons, who is now in this city. There has hardly been time for a reply. The Aero Club is particularly desirous of securing the attendance at this banquet of Secretary of War, Luke E. Wright, and I understood from Mr. McComb that the Secretary would, probably, attend. The Secretary has, however, declined our invitation to attend and speak. I do not think his refusal is final. I think an invitation coming from you with your high standing in the Club and in Science would have great influence with him. Will 26 2 you not oblige the Club and try to get him. Please accept thanks in advance.

The date of the banquet and also the date of the Reception and presentation subject to the approval of the President is now being arranged for, Mr. Chas. R. Flint has cabled Wilbur Wright to be present and the Club is now in correspondence with Orville Wright at Dayton, P O hio.

We invite you to help us in the above matters, except as to the date with the Wrights. The Committee on Medals, of which you are a member, has accepted the artistic design of the sculptor Victor D. Brenner, a famous sculptor. The whole costs of the matter will be about two thousand dollars. Undoubtedly no other such artistic and costly medals will ever be given them with the exception of those of the United States, perhaps, if we can have our way with the United States.

Please excuse this long letter.

(Signed) De Witt C. Morrell Chairman Committee on Medals, Aero Club of America, 15 William St. N.Y.

27

Means to Bell .

To A.G. Bell, Baddeck, N.S.

196 Beacon St. Boston, Mass, Dec. 25, 1908 :— I want to thank you most heartily for all the kindness and hospitality shown to me at Hammondsport.

I also wish to express once more my admiration for the work which your Association has done and is doing.

I believe that you will get a splendid development out of the “Silver-Dart” when you get her on the ice at Nova Scotia. Ice is perfection for getting a start, no jars, no shocks.

The “Loon” is a great machine as she is now rigged with her floats and her hydro-curves. I am looking forward to the time when she first flies from the water. That will be an epoch-making day!

I wish you all kinds of success with the tetrahedral flier, Drome No.5, I think you call it. I shall watch the newspapers eagerly. I have now in the Patent Office eight applications for patents on flying machine accessories. Most of my claims have already been allowed. As soon as my patents are issued I shall take the liberty of sending copies to you.

Please give my regards to Mr. Curtiss and Mr. McCurdy if they are with you and please give them my thanks for the kindness they have shown to me.

Wishing you a very happy new year, I am

(Signed) James Means.

28

Bell to Claudy .

To C.H. Claudy, 523-10th St., N.W., Washington, D.C.

Baddeck, N.S., Dec. 31, 1908: — I have been travelling for some time past and have just returned here. This accounts for my delay in replying to your notes of December 5 and Dec. 17 which have just been brought ?? to my attention.

I am glad to know that you have made the set of enlargements from your fine negatives of the Wright machine and of course I shall be glad to pay the expense you have incurred in the matter if you will kindly send me the bill.

My idea has been that the Aerial Experiment Association should lend its services to the preservation of photographic records of the historical flights of Orville Wright at Fort Meyer. I have therefore arranged with a number of persons who have taken good pictures of these flights to have enlargements made for the Aerial Experiment Association and at the expense of the Association. It is then my intention to present the whole collection to the National Musuem in the name of the Association so that it shall get the credit of the gift.

I should be much obliged if you could place your collection, for the present, in the custody of my son-in-law, Mr. David Fairchild, as I do not expect to be in Washington for some time to come.

The Smithsonian Institution has just established a medal to be called “The Langley Medal” and the first recipient 29 2 will be the Wright V B rothers. The date of presentation has not yet been settled but it is m u y idea that that will be the proper time for the Aerial Experiment Association to present the various collections of photographs to the Smithsonian Institution for preservation in the National Museum. That would also be the proper time for an exhibition of the photographs at one of my Wednesday Evening Receptions or at a special meeting fo t r the purpose.

President Roosevelt is to present to the Wright Brothers, at the White House, the medal of the Aero Club of America and it is probable that the Smithsonian Medal may be given at about the same time, date not yet fixed. It would be very proper, therefore, at that time to have a special meeting at which you could show the photographs you have made and give some explanation of them.

I am very much obliged to you for so kindly remembering my wish in the matter.

(Signed) Alexander Graham Bell.

30

THE OUTLOOK ON AVIATION: By Asst. Editor.

Everybody's Magazine for January contains an article by Maximillian Foster on heavier-than-air machines. This article is of interest to us in that the author has used the word “aerodrome” in speaking of the machine. The word “flyer” is also used. Although it can brag of no Greek or Roman ancestors it is a good self made American word.

Aeronautics for December .

The issue contains an article by our Secretary, McCurdy entitled “ a A erodrome No.4 and the Aerial Experiment Association”. There is also a short article on the “Trial of the Loon Hydroplane”.

The opening remarks of Major Squier in his speech to the American Society of Mechanical Engineers appears in Aeronautics for December.

Forei ? g n News for the Month. Belgium: — The ornithopter of Count de La Hault is reported to have risen from the ground. This machine is driven by a 100 H.P. engine.

The triple surface aerodrome of Baron de Caters has covered a distance of 800 meters. The motor used is a Vivinus of 57 H.P. turning up 1250 rpm.

France :— Wright is still instructing Count de Lambert in the art of flying.

Bleriot is at last building a double-surface aerodrome. Although he believes in a single surface for speed, he prefers the other for stability. The new machine is to have 60 sq. m of surface and 8 sq. m in tip controls, these controls 31 2 being placed at the rear of the surfaces.

Santos Dumont is reported to have made several short flights on November 17 with his single surface aerodrome.

On November 16 the Antoinette I x V single surface aerodrome made good flights of 600 and 700 meters.

On November 16 Farman made a flight of 5 kioms. Farman has added another surface to his machine making it a triple surface aerodrome.

On November 21, Pelterie won the third A.C.F. 200 meter prize by flying 316 m at Buc with his single surface aerodrome “R.E.P. 2 bis” against a measured wind of 21.6 kiloms an hour, with perfect stability.

At The Camp of Satory, under the supervision of engineers and artillery, a military triple surface aerodrome is being constructed of silk. There is a triple surface stabilizing cell in front and rear. The machine is driven by one propeller placed in front of the aviator.

In the latter part of November Pischoff-Koechlin made six short flights of 300 and 500 met ? e rs in his single surface aerodrome. It has 23 sq. m surface, weighs 245 kilos with aviator, 17 H.P. Duteil motor.

Delagrange will soon try four different types of machines one of the Wrights and one a triple surface aerodrome.

The Goupy triple surface aerodrome has made a number of flights at Issy. After 8 flights of 200 and 300 meters in making a turn the motor slowed down, the machi i n e tipping and injuring the right wing.

32

3 Germany :— A Wright aerodrome is being built near Berlin by Mr. Mechner.

L'Aerophile for December .

Delagrange at Savigny :— On November 29, in the presence of a crowd of more than 2000 persons, Leon Delagrange with his single surface aerodrome made several flights of about a quarter of an hour at a height of from 10 to 12 meters.

The Lejeune Aerodrome :— M. Lejeune is having built by M. de Pischof, a double surface aerodrome of bamboo framework with two controls, one in front and one in the rear. A 12 H.P. motor drives two propellers by chains.

Italy and French Aviation :— Lieutenant Calderara, of the Italian Marines, who for some time has been interested in the subject of aerodromics has just been entrusted officially by his Government to participate in aerial experiments and to make them on his own account.

Aerodrome R.E.P. 2 bis :— This single surface aerodrome which gained the third price of 200 meters at Buc approaches nearer the natural form of a bird than any aerodrome yet flown, its greatest spread of surface being from fore to aft.

Foreign Aerodromes.

Spanish in Belgium :— The “Bruxelles Aviators”, a new Belgium Society is going to put in the field a type of aerodrome with 7 m 50 of surface supplied with an 18 H.P. motor, driving a single propeller. The machine is mounted on wheels which it will cast off when it takes the air.

Henry Farman in his triple surface Aerodrome :— The rain having ceased Henry Farman on the 24th of November commenced the 33 4 trials of his machine which has been transformed into a triple surface aerodrome. In the morning several remarkaable flights were made. The velocity of the wind varied from 6 to 14 meters per second. In this gusty wind the celebrated aviator made some very startling manoevers. Sudden squalls of wind would raise the machine 15 or 20 meters and when the squalls has passed the machine would swoop down only to rise again as suddenly as it had fallen. Sometimes, during a squall the machine would stand perfectly still in a horizontal position.

On the 26th of November, at about four o'clock in the afternoon a circular flight of about 9 kilometers in 7 minutes was made.

On the 28th of November Henry Farman made some unique experiments. He took off the third surface of the machine, thus making it a double surface aerodrome and he also reduced the area of the under surface to only 7 meters while the left the upper surface at 12 meters. The supporting surface was thus reduced to 40 sq. m. The total surface of the machine being thus reduced Farman estimated that by reducing the reciprocating parts the machine would be still capable of breaking its former records.

Now, however, Farman has definitely transformed his machine into a triple surface aerodrome.

Note :— In L'Aerophile for December 15th appears a total list of prizes given by the Aero Club of France.

34

Items from the Newspapers .

The Auto Club of America has made an agreement with the Aeronautical Society. The agreement secures the use of Morris Park for the members of the land Club who wish to experiment with impliments of flying.

On Dec. 16 Wright shot up at a severe angle from the foot of the mon - o -rail to a height of 240 feet, and then dropping 50 feet cut off his engine and glided to the earth.

On Dec. 18 while tyring for the Michelin Cup, Wilbur Wright remained in the air one hour fifty-three minutes and fifty one seconds. The distance officially measured was sixty-one and one half miles. The Michelin Cup is to be awarded to the aviator who makes the longest flight before Dec. 31. Wright also rose to a height of 360 feet winning the Sarthe Aero Club prize for height on the same day.

On New Years Day Bleriot, Farman, Delagrange, and Wright will receive the red ribbon of the Legion of Honor.

John D. Hall is the inventor of a machine which is said to combine the Aerodrome and Helicopter.

Toy dirigibles and aerodromes were on sale for Christmas in Germany, and seem to have sold well.

The following remarks are quoted from a speech of President Bishop of the Aero Club: — “The apathy of the American people in the science of Aviation is deplorable. In France there are prizes to be gained amounting to as much as $50,000.00; here there is practically nothing tangible to incite genius in this line***”.

35

Mr. Lahm, father of Lieut. Lahm in speaking of his flight with Wright said:— “I feel that now the experimental stage of flying has been passed and we have arrived at the time of practical demonstration and the phase of commercial interest”.

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXVII Issued MONDAY, JAN. 11, 1909

Association's Copy.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell AssistantEditor

Charles R. Cox Typewriter

Mabel B. Mccurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO. XXVII ISSUED MONDAY JAN. 11, 1909.

Beinn Bhreagh, Near Baddeck, Nova Scotia .

TABLE OF CONTENTS .

1

EDITORIAL NOTES AND COMMEN TS.

Father Lana's Book of 1670 .

More than 100 years before the invention of the Balloon by the Brothers Montgolfier (1783) a remarkable work, foreshadowing the balloon, had been written by a Jesuit Priest named Francis Lana. The work was entitled, “Prodromo dell' Arte Maestra” and was published in Brescia in 1670. The book contained “A demonstration, how it is practically possible to make a ship, which shall be sustained by the air, and may be moved either by sails or oars”. The appearance of the work made a ?ee pro found impression upon the world at the time and is probably responsible for the expression aerial “navigation” which has persisted down to the present day. All works dealing with the history of Aeronautics refer to Father Lana's book, but none, so far as I know, have quoted from the work itself, so that the book is only known by its title and by the picture of Father Lana's machine which has been widely reproduced.

On the 29th of May 1679, and again on the 5th of June 1679, Dr. Robert Hooke read before the Royal Society of England a translation of a portion of Father Lana's book “Prodromo”. This translation, with the remarks of Dr. Hooke concerning it was published in a work entitled, “Dr. Hooke's Tracts and Collections 1674–1679”, a copy of which may be found in the Boston Public Library.

A few years ago, at my request, Mr. Edwin P. Grosvenor visited the Boston Public Library and made a copy of Hooke's 2 2 translation which I give below. A.G.B.

AERIAL LOCOMTION DISCUSSED BY THE ROYAL SOCIETY, GREAT BRITAIN IN THE 17TH CENTURY (1661–1679).

No work relating to the history of Aerial Locomotion so far as I know, makes reference to the fact that the art of flying was discussed by the early members of the Royal Society and that aeroplane experiments were made by them in the 17th Century. It is true they were not called 'aeroplane” experiments but they were really the same thing. For example:— Dr. Wrenn (Sir Christopher Wrenn), the designer of St. Paul's Cathedral, made experiments with several round pasteboards to test their velocity in falling; Dr. Hooke proposed experiments to ascertain the strength requisite to make a wing, or expanded area sustain a determinate bulk in the air, and suggested “that it was not sufficient to have a theory for the descent of an expanded area perpendicularly down ward, because the descent of an expanded area, moved edgewise horizontally in the air, was extremely different; in which way, however, all motion of flying must be performed”.

I give below quotations from the “History of the Royal Society” by Thomas Birch referring to experiments and discussions having a bearing upon Aerial Locomotion between the years 1661 and 1679, and a few biographical notes concerning Hooke, Petty and Wrenn. A.G.B.

3

DR. ROBERT HOOKE. 1635–1703

An original ingenious experimental Philosopher born 1635, died 1703. About 1655 he was employed and patronized by the Honorable Robert Boyle who turned his skill to account in the construction of his celebrated air-pump.

Between 1657 and 1659 Hooke's inventive faculty exercised itself in devising thirty different methods of flying according to the Encyclopedia Britannica.

In 1662 he was appointed curator of experiments to the Royal Society and filled the office with extraordinary diligence and skill during the remainder of his life.

During this period he translated into English the 6th Chapter of Lana's work “Prodromo” which appeared among his posthumous philosophical contributions.

Birch's History of the Royal Society contains references between 1661 and 1679 to discussions concerning the art of flying participated in by Hooke, but I have not found any description of his ideas relating to artificial flight produced between 1657 and 1659. It might be well to institute a search through his published writings for some descriptions of his ideas.

He seems to have been an invalid all his life. His limbs were shrunken. His hair hung in dishevelled locks over his ha ard countenance. His temper was irritable, his habits penurious and solitary. He was, however, blameless in morals and reverent in religion. His scientific performances were varied and original, and he has left behind him the reputation of being one of the greatest experimental philosophers the world has ever seen. A.G.B.

4

SIR WILLIAM PETTY. 1623–1687.

He was born in 1623. About 15 years of age went to Normandy trading with a little stock of merchandise and so maintained himself while studying. On his return to England was in Royal Navy for a time. In 1643 went abroad again and remained for three years in France and the Netherlands. In 1647 Petty obtained patent for the invention of double writing, or in other words of a copying machine. In 1648 occurred his first publication "Advice for the Advancement of some particular parts of Learning". Same year deputy Prof. of Anatomy in Oxford and gave instructions in Anatomy and Chemistry. 1649 Dr. of physic and Fellow of Brasenose College. 1650 succeeded in restoring to life a woman who had been hanged. 1651 Prof. of Anatomy in Oxford and also Prof. of Music at Gresham College. 1652 physician to the Army in Ireland and in 1654 he made a survey of the lands granted to the soldiers in Ireland by which he gained 9000 pounds which he invested profitably. He thus ultimately became the owner of about 50,000 acres of land in Ireland. Set up iron works, opened lead mines and marble quarries; established a pilchard fishery and commenced a trade in timber. In 1663 attracted much attention by the invention of a double-bottomed ship. One of the first members of the Royal Society. Died 1687. Petty was a man of remarkable versatility, ingenuity and resource. Evelyn declared he had "never known such another genius", and said of him, "if I were a Prince I would make him my second councillor at least." A.G.B.

5

SIR CHRISTOPHER WRENN. 1632–1723.

Born 1632. He invented several ingenious instruments when he was about the age of fourteen. In 1646 went to Oxford as gentleman commoner. Early distinguished for proficiency in mathematics and anatomy and was regarded as a protegy in College. Prof. of Astronomy in 1657. One of the first members of the Royal Society. In 1661 was appointed assistant to the Surveyor General and began to turn his attention to architecture. In 1667 he succeeded Denham as s S urveyor General and Chief Architect. His master-piece is St. Paul's Cathedral. Generally regarded as the greatest of English Architects. Contr o i buted several treatises on Astronomy and other sciences to the Philosophical Transactions. He was knighted in 1673, and was elected President of the Royal Society in 1681. None of the biographical notices I have examined make any reference to his interest in Aerial Locomotion. He is perhaps best known to the world as the Architect of St. Pauls' Cathedral in London. He died in 1723 and was buried in his own Cathedral and a conspicuous tablet there bears the epitaph “Si monumentum requiris, circumpice” — “If a monument is needed look around”. A.G.B.

6

A DEMONSTRATION, HOW IT IS PRACTICALLY POSSIBLE TO MAKE A SHIP, WHICH SHALL BE SUSTAINED BY THE AIR, AND MAY BE MOVED EITHER BY SAILS OR OARS.

(A translation of the 6th Chapter of Father Lana's book, “Prodromo dell' Arte Maestra,” Brescia, 1670, by Dr. Robert Hooke, read before the Royal Society of England May 29, 1679, and published in Dr. Hook's Tracts and Collections 1674–1679).

The Curiosity and Ardor of Humane Wit hath not been so bounded by preceding Inventions, as not to be yet further inquisitive after some other waies how men themselves may, like birds, Fly in the Air. Nor is it, perhaps, a meer Fable which is recorded of

Daedalus and Icarus, since 'tis reported for a truth, that even in our times, a certain Person whose name I know not, did by some such artifice of Flying, pass over the Perusine Lake; though afterwards, his descending to light upon the Earth, being too quick, he fell down, with the loss of his life. But no one yet thought it possible to make a ship which should pass through the Air, as if it were sustained by the Water, because they have judged it impossible to make an Engine which should be lighter than the Air, which is, nevertheless, necessary to be done in order to produce this effect.

But I, whose Genius and desire hath alwaies prompted me to endeavour, to my utmost, to find out difficult Inventions, do hope, at length, I have light upon a way of making such an Engine as shall not only by its being lighter than the Air, raise itself in the Air, but together, with itself, Buoy up and carry into the Air Men, or any other weight. Nor do I believe I deceive myself, since I confirm the thing both 7 2 by certain Experiments, and by Demonstration, drawn from the Eleventh Book of Euclid , hitherto thought infallible of all Mathematicians.

I will therefore premise some Suppositions, and from those afterwards, deduce a practicable way of making this Ship, which, though it may not deserve, like Jasons Argo, a place among the Stars, yet that way shall it of its own nature tend.

I suppose then First, That the Air hath weight, because of the vapours and exhalations, which are raised from and incompass our Terraqueous Globe to the height of many miles. And this will not be denied me by such Philosophers, as are but any way versed in Experiments. And the proof of it may be made by evacuating, if not all, yet a great part of the Air, out of a Glass-vessel, which having been first weighed, and after the extracting of the Air weighed again, will be found notably lessen'd in weight. Now how much the weight of the Air is, I have found in this manner: I took a large Glass-vessel, the neck of which could be shut and opened by a Stop-cork; and being open I heated it at the fire, so that the Air in it being rarified, issued out of it in great part: Then I suddenly shut it, so that the Air could not re-enter, and weighed it: which done, I sunk the neck under water, the body of the Glass remaining all above the water; and opening it, the water ascended into the Glass, and filled the greater part of it. Then I opened it again, and let out the water, which I weighed, and measured the Bulk and quantity thereof. Whence 8 3 I inferred, that so much Air had issued out of the Glass, as there was water that had entered to fill the part left by the air. I again weighed the Vessel, first well wiped dry, and I found that it weighed an ounce more whilst it was full of Air, than it did when the greater part of it was evacuated. So that that surplus of weight was a quantity of Air, equal in bulk to the water that had entered into the place thereof. Now that water weighed six hundred and forty ounces: whence I conclude, that the weight of the Air, compared with that of the Water, is, as one to six hundred and forty ounces, that is, if the Water, which fills a Vessel, weighs six hundred and forty ounces, the Air filling the same Vessel weighs one ounce.

I suppose, Secondly , That a Cubic foot of Water weighs “80 L” or 96o ounces, according to the Experiment of Villalpandus , which agrees very near with mine; forasmuch as I found that that Water which weighed 640 ounces, was little less than # of a Cubic foot; whence it follows, that if # of a foot of Air weighs an ounce, a whole foot will weigh 1-½ ounce.

I suppose, Thirdly , That any great Vessel may be altogether evacuated of Air, or at least of the greatest part of the Air: And this I shall show to be feazable many waies, in my Work Del Arte Maestra ; the mean time I shall transcribe hither one of the most easie waies.

Let any great Glass-vessel be taken, that is round and hath a neck, and let to the neck be fastened a Brass or Latten Cane, at least 47 modern Roman Palms long; the longer the surer 9 4 the effect will be. Let there be near the said Vessel a Stop-cork, so closing the Glass that no Air can enter. Fill the whole Glass, and the whole Cane full of Water; then shutting the Cane in the extream part, let the Vessel be inverted, so as that it stand on its upper part, and let the extreme part of the Cane be immersed in water; and whilst it is immersed in the water, let it be opened, that the Water may issue out of the Vessel; which will all go out of it, the Cane remaining full to the height of 46 Palmes, and 26 Minutes, and the remaining space above will be empty, there being no way for the Air to enter: then shut the neck of the Vessel with the Stop-cock, and the Vessel will be empty. He that disbelieves it, let him weigh it, and he will find, that as many Cubic feet of water as there are issued out, so many ounces and half ounces less will it weigh, than what it weighed first, when it was full of Air: which is sufficient for my purpose.

I suppose, Fourthly , The truth of the Demonstrations of Euclides 11 and 12 Books, which are also evident by Experiment, which proveth, that the Superfice of Balls or Spheres increaseth in a duplicate proportion to their Diameters, and their solidity in a triplicate. Duplicate proportion is, when three numbers are such, that the third contains the second as often as the second contains the first, as 1, 3, 9. or 1, 4, 16. And triplicate proportion is when 4 such numbers are taken of which the 4th contains the 3rd as often as the 3rd contains the 2nd, and the 3rd contains the 2nd as often as this contains the 1st, as in 1, 3, 9, 27. or in 1, 4, 16, 64. So if you take two Balls, one of which have a Diameter twice as big 10 5 as the other, the surface of the Ball of two Palmes (e. g.) shall be four times bigger than the surface of the Ball of one Palm; and the whole solidity of the Ball of two Palmes Diameter, increasing in a triplicate proportion, shall be eight times as great, and consequently eight times heavier than a Ball of one Palms in Diameter: so that the surface of the greater to the surface of the smaller shall be as 4 to 1, and the solidity as 8 to 1.

I suppose, Fifthly , That where one body is lighter in Specie than another, the lighter ascends in the other that is heavier, if the heavier be a liquid body; as a Ball of ordinary Wood on Water, because it is lighter in Specie than water; so also a Ball of Glass full of Air will swim at the top of water, because though Glass be heavier than water, yet taking the whole complex of the Ball, Glass and Air together, it is lighter than that, which is only a body of water.

These things being supposed 'tis certain, that if we could make a Vessel of Glass, or other matter, that might weigh less than the Air that is in it, and should draw out all its Air, after the manner above directed, this Vessel would be lighter in Specie than Air itself, so that by the Fifth Supposition, it would swim on the top of the Air, and ascend on high. Ex . gr . if we could make a Vessel of Glass, holding a foot of water, that is 80 lb. and were so thin and subtile as to weigh less than an ounce and a half: The Air being thence evacuated, which by the First and Second Supposition 11 6 would weigh 1-½ ounce, that Vessel would remain lighter than Air it self, and mount on the top of it, supported by its own lightness. It may be, that this Vessel capable of one foot of water, and yet so subtile withal as to weigh less than 1-½ ounce, cannot be made of Glass, neither of any other matter that shall remain consistent and stiff: But then let us make a much bigger Vessel, with double the quantity of Glass, then we shall have a Vessel that shall contain four times as much water, that is four foot water, and consequently six ounces of Air; since, that, according ? t o the fourth Supposition, the capacity of the Vessel increases in a duplicate proportion to the surface. So that he that should make a Vessel capable of four foot of Air, and weighing less than six ounces, the six ounces of Air being thence evacuated, would have a Vessel lighter than Air. And the maki l n g of this second Vessel lighter than Air, is twice easier than of the First. But because even this second Vessel may possibly not be made so light, as to be less than six ounces weight, and to be capable of four foot of Air, let a bigger be made, holding twice as much as the second, viz . of eight foot, and consequently containing twelve ounces of Air, which vessel doth weigh less than twelve ounces; and the making of this third Vessel will be yet easier than the second. In a word, let the capacity of the Vessel be increased more and more, forasmuch as as this will alwaies increase more than that of the surface, that is, the matter and the weight of which 'tis made; and we shall arrive to such a bigness, that although it be made of a dense 12 7 and heavy matter, yet the weight of the Air, it shall contain, shall exceed the weight of the matter that makes up the surface of that Vessel; because, as hath been said, the capacity increases in double proportion to the surface.

Let us see then of what determinate b e i gness a Brass Vessel may be made; an let us suppose, the thinness of the Brass to be such, that a plate of it, a foot broad and long, do weigh three ounces; which it not difficult to make. Let us make of such a thin plate a round Vessel, of the Diameter and bigness of fou t r teen foot: So that the Air being exhausted out of it, and the bare Vessel remaining lighter than an equal bulk of Air, must needs of itself mount up into the Air. To demonstrate which, there needs no more than the sure rule of Archimedes for measuring a Sphere: which is, that the Di mm am eter to the circumference of a circle is as 7 to 22, more or less: So that su ? p posing our Vessel to be of fourteen foot in Diameter, the circumference will be forty four. Further, to know, how many square feet must be in the whole surface of a circular Vessel, the same teaches, that the Diameter must be mu r l tiplyed by the circumference, which when done in our case, will give us our surface of 616 square feet of Brass-plate, each of which we have supposed to weigh three ounces, so that 616 multiplyed by three we shall have 1848 ounces: which is the weight of all the Brass the Ball or Sphere consists of, that is 154 pounds. Now let us see, whether the Air contained in that Vessel do weigh more than 154 pounds; for if it do, the Air being evacuated, the Vessel will be lighter than it; and the lighter it shall prove than it, so much weight may it 13 8 carry up along with it into the Air. To estimate the weight of the Air contain'd in it, we must consider how many Cubic feet of Air it holds, of which we have shown that each weighs an ounce and a half. To do which, Archim d e des teaches us again, that we must multiply the Semidiameter (7) through the third part of the surface, which will be 205-# which done, we have the capacity of the Vessel, viz. 1437-# feet; and because each foot of Air weighs 1-½ ounce, the weight of the whole Air contain'd in that Vessel will be 2155-# ounces, or 179 pounds and 7-# ounces. But now, the Brass of which the Vessel is made, weighing only 154 pounds, the Vessel is 25 pounds and 7-# ounces lighter than Air; which was to be demonstrated, so that the Air being evacuated, the Vessel will not only ascend into the Air, but also carry with it on high a weight of 25 L and 7-# ounces.

But to raise a greater weight, and to elevate even men into the Air, let us take the double of Brass, viz. 1232 foot, which are 308 pounds of Brass; with which double quantity of Brass we can make a Vessel, four times bigger than the former; and consequently the Air that shall be contain'd in such a Vessel will weigh 718 pounds and 4-¾ ounces; so that that Air being drawn out of this Vessel, the Vessel will remain 410.L. and 4-# ounces lighter as so much Air, and consequently will be able to raise on high two or three men.

Whence 'tis evident, that the bigger the Sphere or Vessel is, the Brass may be the thicker; because that as the weight of it increaseth, so the capacity of the same increases 14 9 still more and more, and consequently the weight of the Air; whence it can still raise more weight into the Air.

Whilst I thus relate this matter, I cannot chuse but smile to hear a Fable, which to me seems not less incredible and extravagant than those Chimera's which sprung out of the phantastical brain of that rational merry mad Droll Lucian . And yet on the other side, I clearly know that I have not erred in my Demonstrations, and when I had communicated them to divers Learned and prudent men, they could not find any error in my Discourse, and desired nothing more than to see an experiment of it in one Globe, ra s i sing itself up into the Air of its own accord, which I should willingly have prepared befor I had published this my Invention, if the Religious poverty which I profess had not disabled me from laying out a hundred Ducats, which would have been abundantly sufficient, on the tryal of so pleasant a Curiosity. For which cause I do earnestly intreat my Readers, that they would acquaint me with their success, because though, perhaps, from some faileur or mistake in the operation, it may not succeed so happily at first, I may perhaps supply a way of amending that error. And that I may excite and put courage into some of them to make a tryal of it, I shall here remove some difficulties which may seem to obtstruct the Practice of th e i s Invention.

And first, some Difficulties may occur in the way above prescribed of evacuating the aforesaid Spheres, where it is required to invert the Sphere upon a Tube or hollow pipe, by lifting that up to a great height which formerly laid on the ground, which could not indeed be done without some great 15 10 Machine, and greater difficulty, by reason of the greatness of this Sp e h erical Vessel, and that filled with water. To this evil I can easily supply a remedy that the Sphere shall not at all need to be moved out of its place. Let the Sphere therefore be placed when empty about 33 foot high, and to its under-part or neck, let there be added a Tube of 33 foot long, carefully stopped below, afterwards let the vessel and Tube be filled by a hole at the top; and when that is done, let that hole be carefully stopped with a value: then to evacuate the vessel, there will need nothing but to open its lower end of the Tube under water, that the air may not get into the place left by the water; then the water being all run out of the Globe, turn the Stop-cock at the neck of it, and remove the Tube from under it, and we shall have the vessel evacuated. Which if it be not wholly evacuated of air (of which I will not now dispute) this is at least certain, that its weight shall be by so many ounces and half ounces lighter, as there were Cubical feet of water before contain'd in its capacity, which is sufficient for our purpose. This is now a proved Experiment, as I have said above; great care only must be had that the value or Stop-cock, with which the Vessel is closed, be made very good and exact, that the air may not get into it by its chinks.

Secondly , A difficulty may arise about the slenderness of the Vessel, because the air seeking to enter with great impetuosity to hinder the vacuum, or at least the violent rarefaction, may seem to be able to compress it, and though possibly not to break it, yet to crush it so as to make it 16 11 lose its roundness.

To this I Answer, That this would happen, were not the vessel round, but since it is Spherical, the air compasses it equally on all sides, so that it does rather strengthen it than break it, which is observable in Glass-vessels, which though made of thick Glass; yet if they were not round, would be broken into a thousand pieces: whereas on the other side, round Glass vessels, though very slender, are not broken, nor is a perfect roundness necessary, but it will suffice if it does not much vary from a Spherical Figure.

Thirdly , In the forming a Sphere out of Copper, there may be made two Hemispheres, which may be afterwards joyn'd and soder'd together with Tin, after the usual manner, or else the several parts of the Sp e h ere may be made apart, and after the same manner joyned, in which there cannot remain any great difficulty.

Fourthly , A doubt may arise to what Altitude int the Air our Ship will rise, since if it should be raised above all the Air, which is commonly esteemed to be fifty Miles, little more or less, in height, as we shall afterwards see: It would follow that men would not be able to breath.

To which I answer, That by how much the Air is higher, by so much the more thin and light it is, so that the Ship being B o u oyed up to a ce t r tain height it cannot rise higher, for that the upper Air being lighter, it would not be fit to sustain it, and thence it will stay in that place where it finds the Air so subtil as to be of equal weight with the whole Engine, and the men in it. 17 12 Then least it should be carryed too high, it will be convenient to burthen it with weights, heavier or lighter according to the height to which it is designed to rise; but if it shou ; l d be carryed higher than it ought, there is an easie remedy by opening a little the Stop-cocks of the Spheres, and admitting a little Air, for so losing some part of their Levity, they will, together with the Ship, descend. As on the contrary, if it should not ascend to its desired height, we can help it by removing the weights it carryed up. In the like manner, being to descend to the Earth, we must turn the Cocks of the Spheres, whereby the Air entering, it will lose its Levity, and so descend till the Ship be quietly plac'd on the Ground.

Fifthly , Some may Object that this Ship cannot be moved by Oars, because these only move a vessel on the Water; in as much as the Water resists their motion, but the Air cannot resist.

To which I answer, that the Air, though it does not resist the Oars so as the Water, because 'tis more subtile and moveable, yet it does notably resist and s i u fficiently to move the Ship. Since by how much the less the resistance of the Air is to the motion of the Oars, by so much the less is it to the motion of the Ship; from whence a little resistance to the Oars may make it move very swift; besides, that it will be seldom necessary to use Oars, because we always have in the Air Winds, which though they be never so weak, will yet be sufficient to carry it with great swiftness: And if the Wind should happen to be contrary to our 18 13 voyage, I will in another place teach how to place the Mast o o f a Ship, so as to Sail with any Wind, not only in the Air, but in the Water.

Sixthly, The Difficulty is greater in stopping the too great impetuosity, with which a violent Wind may carry our Ship, so that there will be danger of dashing against the tops of Mountains, which are Rocks in this Ocean of the Air, or else of overturning it utterly. To the second, I say 'twill be diffult for the whole Engine to be over-turned by the Wind, with all the men in it, which are a counterpoise to the Levity of the Spheres; whence these will be alwaies uppermost, and the Ship can never be above them. Besides that, since the Ship can never fall to the Ground unless the Air gets into the Spheres, there is no danger of suffocation of the Air as there is in the Water; besides all this, the men being bound to the Beams or Ropes of the Ship, are safe from fear of their falling. But as to the first, I confess this our Ship, may undergo many dangers, but none greater than what Water Ships are subject to. For as these, so ours can make use of Anchors to fasten to Trees. That I may say nothing of the Ocean of the Air, which though it has no Shores, has yet the conveniency of Ports, where the Ship may be in safety, sinc when there is any danger, it may descend and remain on the Ground.

Other difficulties I see not, which may be objected against this Invention, besides one which to me seems greater than all the rest, and that is, That it may be thought, that God will never suffer this Invention to take effect, because of the many consequencies which may disturb the Civil Government 19 14 of men. For who sees not, that No City can be secure against attack, since our Ship may at any time be placed directly over it, and descending down may discharge Souldiers; the same would happen to private Houses, and Ships on the Sea; for our Ship descending out of the Air to the Sails of Sea-Ships, it may cut their Ropes, yea without descending by casting Grapples it may over-set them, kill their men, burn their Ships by artificial Fire works and fire balls And this they may do not only to Ships but to great Buildings, Castles, Cities, with such security that they which cast these things down from a height out of Gun-shot, cannot on the other side be offended by those from below. Thus far the Ingenious Father.

DR. HOOK'S REMARKS CONCERNING THE ABOVE .

A man that hears all these things, and should believe the terrible and mischievous consequences, would possibly be of the Author's mind, and think also that he very much deserved to be punisht himself, who had thus unluckily discovered so Diabolical an Engine, that should at once subvert the Government, peace and security of mankind, and bring in swarms of Barbarians to disturb the quiet and civilized World. But hold a little, let him alone till inquiring into matter of Fact he be found Guilty. Let us examine therefore, whether his grounds and process of Demonstration be true, that we may in time think of waies of defending ourselves against these evils that may hover over our heads, if such there be.

20

15 First , Then I find Dr. Wilkins , in his discovery of a new World, quotes Albertus de Saxonia , and Francis Mendoca , for the Inventors of this opinion, that the Air is Navigable; and that upon this Statick principle, any Brass or Iron vessel whose substance is much heavier than that of the Water, yet being filled with the lighter air, it will swim upon it and not sink. The same thing is quoted also by Schottus . And several Experiments to this purpose, were made here in the year 1664, but without th r e wish'd for success. Now to the matter itself, he supposes the air to be heavy, so far he is right, and the consequence, that an exhausted vessel is lighter by the weight of the air extracted, has been here proved. But then supposing it to be but 640 times lighter than water, he supposes it much too heavy, for I find it to be above 800 times lighter than water. H N ow a Cubic foot of Water weighing 912 ounces Troy-weight, a Cubic foot of air weighs about 1 14 ounces, or one ounce and one seventh of an ounce: so that upon this account it is much more difficult than he imagines by reason of the greater levity of the air. But yet that were superable.

Next 'tis granted, That Spheres are to one another, as the Cubes of their Diameters, whereas the surfaces of them are only as the squares of their Diameters.

But whereas he supposes Copper of three ounces in a foot square to be sufficient thickness to resist the pressure of the air in a Globe of 14 foot square, nay of any Dimensions we can no wise assent to him; for the pressure from without inwards, though it be alwaies the same upon equal surfaces, 21 16 yet upon unequal surfaces the case is quite otherwise, for there the pressure will be found not the same, but to increase alwaies in the same proportion with the surface, and thence consequently the thickness of his Copper, or any other Mettal or material, which he shall make use of, must increase in the same proportion with the Diameter of the Sphere, and consequently the weight of his Copper must alwaies increase in the same proportion, at least to the solidity of his Sphere, so that by augmenting the quantity of his Sphere, he has no manner of advantage of making it proportionably lighter than the Air, and proportionably strong, But the contrary; for it is manifest that a bigger Sphere so made of any matter, we yet know, has less power of resisting the same pressure of the air than a less, because of the finite resistance of matter to pressure, there being some degree of pressure that will crush every body. And therefore he that cannot make the experiment succeed in small, will be sure never make it do in great.

But in this lies the fallacy of the Authors Reasoning, and this is the Rock that has precipitated his Ship to the Ground, and not the tops of the Mountains, nor the Whirl Winds of the air, whereby all those Direful presages vanish, so that I hope I have cleer'd the Author in your opinions of his doing any great harm by this Invention to the Civil and Peaceful G i o vernment of the World.

22

EXTRACTS FROM THE HISTORY OF THE ROYAL SOCIETY BY THOMAS BIRCH, RELATING TO AEROPLANE EXPERIMENTS AND THE ART OF FLYING (1661–1679).

1661–2, January 1 (Vol. I, p. 68):—"Dr. Wrenn was requested to prosecute his design of trying, by several round paste-boards, their velocity in falling.

1661–2, March 5, (Vol. I, p. 77):—Mr. ROOKE" (sic) "and Mr. CROUNE were desired to try the experiment mentioned by Monsieur HUYGENS of a feather to be let fall before and after the exsuction of the air in the said engine." (Boyle's engine)

1662–3, Feb. 25, (Vol. II, p. 203):—From Mr. HOOKE'S"scheme of Inquiries concerning the Air".

*** "What the resistance of the air is to bodies moved through it? How much it retards the descent of heavy bodies? How much it stops the motion of a pendulum? and whether that be the only cause of a pendulum's losing its motion? How it bears up dust, smoak, &c. How it sustains birds? The strength requisite to make a wing, or expanded area, sustain a determinate bulk in the air? And here, what bulk may be raised by what kind of contrivance? As what by that contrivance, which children use to make their paper kites of? What means may be thought of for raising a man; for raising lights to a considerable height; for conveying intelligence? What contrivance may be made for letting bodies fall from certain hights, for knowing the swiftness of their descent? and what other experiments may be tried this way?

1662–3, March 4 (Vol. I, p. 205):— The following experiments, concerning the resistance of air to bodies moved through it, was brought in by Mr. HOOKE.

23

2 "For the finding out the resistance of the air to bodies moved through it, it will be necessary, that trials should be made with pendulums of all sorts, whose weights should be made with several sorts of materials; as of metals, stones, woods, feathers, wools &c. and these fashioned into several shapes, as round, elliptical, square, oblong, flat; to be moved flatways, or edgeways, and the like;" &c. &c. &c. 1665, June 21 (Vol. II, p. 59):—

Occasion being given to discourse of the art of flying, and Dr. WRENN being desired to leave with the Society what he had considered on this subject, promised to do so.

He, affirmed, that a man would be able so often to move the wings, as he could with double his own weight on his back ascend a pair of stairs built at an angle of forty-five degrees.

Mr. HOOKE suggested, that it was not sufficient to have a theory for the descent of an expanded area perpendicularl downward, because the descent of an expanded area, moved edgewise horizontally in the air, was extremely different; in which way, however, all motion of flying must be performed.

1668–9 Feb. 25 , (Vol. II, p. 350):— At a meeting of the Society, some experiments were made, to find what would be the resistance of air to bodies moved through it with several velocities; and it seemed, that the larger the arch was, in which the pendulums body moved, the more impediment it suffered from the air: And the slower it moved through the air, as when it moved in a smaller arch of a circle, the less stop it received from the impediment of the air, and the impediment to motion decreased in a greater proportion that the decrease 24 3 of the velocity: But what the exact proportion of decrease was, was to be found out by farther trials.

It was ordered, that this kind of experiments should be prosecuted at the next meeting by employing boards or plates of several expansions, but all of the same weight; and with balls or boards of several weights, but of the same expansion.

(N.B. More experiments to find the resistance of the air to bodies moved through it with several velocities were made March 4 and March 11, 1668–9, see Vol. II, p. 352 & 354. A.G.B).

1673, Nov. 27, (Vol. III, p. 111):— Mr. HOOKE showed an attempt of his, of making a vessel so thin, that when evacuated of the air contained in it, it might swim in the air.

He mentioned also, that a ce t r tain Italian clergyman, named Lana had written upon this subject; whose book he thought had been formerly presented to the Society by their Secretary, but was still in his hands.

1674–5, Feb. 11, (Vol. III, p. 181):— Dr. CROUNE read his discourse concerning the manner how flying is performed by birds; showing, in order thereunto, the structure of a duck's wing and body, especially of the muscles and their insertions into the humerus.

This discourse was ordered to be registered, though the doctor did not then leave it with the Society.

He having intimated a quite different structure of the body of man from that of birds, and thence concluded his utter unfitness for flying, gave occasion to some of the members to remark, that what nature had denied to the body of man, might 25 4 be supplied by his reason and by art.

Mr. HOOKE intimated, that there was a way, which he knew, to produce strength, so as to give to one man the strength of ten or twenty men or more, and to contrive muscles for him of an equivalent strength to those in birds. He hinted likewise, that a contrivance might be made of something more proper for the feet of man to tread the air, than for his arms to beat the air.

Sir WILLIAM PETTY mentioned, that perhaps it might prove of use to consider, whether gun powder, being of so great and quick a force, might not be slackened to give a slower motion, as in the mortar-piece the shell is much more slowly carried through the air than a bullet out of a musket.

Some said, that it would be of real use to contrive something for flying, if it were but to raise a man so high, as to fly over a wall, and the besiegers of a town to carry and bring back intelligence.

1677–8, Feb. 21 (Vol. III, p. 385):— Mr. HOOKE produced an instrument to examine and show at all times the specific gravity of the air, in which it is placed, without any respect to the heat or cold, pressure or spring of the air; But the said property of the air was not showed singly by any other instrument; nor was it proper or capable to show any other quality of the air, as some had thought, except only the specific gravity of the air.*** This instrument made to demonstrate the said property of the air was a very large and thin ball of glass sealed up hermetically. It was supended at the end of an exact beam (which would easily turn either one way or the other 26 5 and was counterpoised by a small weight of lead or brass; but lead was best for that purpose. Then Mr. Hooke explained the same, and showed the reason, why the ball would rise when the air, in which it hung, was heavier and sink when it was lighter; and that it depended upon the same ground with the improvement of ARCHIMEDES' experiment by GHETALDUS". (Some discussion followed this. A.G.B).

1678, Apr. 4, (Vol. III, p. 398):— (In some discussion concerning the accelleration of the motion of falling bodies, Mr. Hooke drew attention to the fact that a feather let fall in a vacuum moved with accellerated velocity, whereas, in air it fell with uniform velocity, and added an interesting argument upon the subject. A.G.B).

"And farther, that in the thinnest medium, though the accelleration was pretty near what was supposed by the aforesaid authors yet that it was in none mathematically true, but that there would be in all mediums a certain degree of velocity, which the same descending body would never exceed, though other descending bodies might, and some others would never arrive to: after which degree was attained, the progress of the body would always be made by equal spaces in equal times, though ever so far continued, provided the gravitating powers remained the same."

1678, April, 18 (Vol. III, p. 400):— SIR JONAS MOORE alledged that in shooting granados he had found, that the greatest random was below 45 degrees of inclination. And that shooting at 20 degrees would fly much further than shooting at 70; The reason of which was the density and resistance of the air to the body passing through it, whereby that, which was shot at 70 degrees, passing through a greater quantity of air, received a greater impediment and hindrance from moving exactly 27 6 in a parabolic line, than that which was shot at 20.

1679, May 8 (Vol. III, p. 481):—Mr. HOOKE produced and read a paper, containing a description of the way of flying, invented and practiced by one Mons. BESNIER, a smith of Sable, in the County of Mayne, the contrivance of which consisted in ordering four wings folding and shuttinglike folding, to be moved by his hands before and legs behind so as to move diagonally, and to counterpoise each other; by which he was, it was said, able to fly, from a high place, cross a river to a pretty distance.

Dr. CROUNE remarked, that in the Paris Gazette there was mention made of one, who had lately flown there from the top of the steeple to the ground at a considerable distance, and had lighted safe.

He observed likewise, that the bodies of fowls were made in all parts light and strong, and particularly in their bones.

Mr. HOOKE produced a model of the contrivance of the wings made with pasteboard, whereby both the manner of the motion of them diagonally, and also of their opening and shutting, was explained; though he supposed that not to be the best way contrived for the performing that effect after that manner, but that the same d s ort of wings might be much more advantageously made and used for that effect.

SIR JONAS MOORE related, that one Mr. GASCOIGNE had, about forty year d s before, made a contrivance for flying, by which he had been able to make a boy at Knaresborough fly a considerable way; b y u t that he being frightened in his flight by the acclamations of the spectators, fell down before he 28 7 designed to alight, and though not much hurt, would not attempt it any farther.

Mr. HENSHAW conceived, that by reason of the weakness of a man's arms for such kind of motions, it would be much more probable to make a chariot, or such like machine, with springs and wheels to move the wings, that should serve to carry one or more men in it to act and guide it.

Several relations were mentioned of the strength of the wings of fowls, and amongst the rest Mr. HENSHAW took notice, that he had known a man of fifty years old beat down by the stroke of the wings of a swan.

1679, May 29, (Vol. III, p. 487):— Mr. HOOKE read a translation of a chapter of the Italian book of Father Francisco Lana, intitled Prodromo , being an explication and demonstration, as he supposed, of a way to make a vessel to swim and float in the air, so as to carry in it one or more men with other heavy bodies, invented, as he says, by himself, in order to make flying practicable, which had before been thought impossible.

(A foot-note says see Mr. HOOKE's Philosophical Collections No. I, p. 18 A.G.B).

1679, June 5 , (Vol. III, P. 489):— Mr. HOOKE read a farther discourse of Padre Lana concerning flying, which he had translated; and added to it a discourse of the impossibility of that attempt by that means; and also showed wherein the author had been greatly mistaken in the grounds and suppositions of his demonstration, viz: in supposing the same thickness of metal to be sufficient to resist the pressure of the 29 8 air inward in a ball of twenty-four feet diameter as in a ball of one foot diameter: Whereas on the contrary it is necessary to increase the weight of the shell more than according to the proportion of the solidity or capacity of the ball.

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXVIII Issued MONDAY, JAN. 18, 1909

ASSOCIATION'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell Assistant Editor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO.XXVIII ISSUED MONDAY JAN. 18, 1909 .

Beinn Bhreagh, Near Baddeck, Nova Scotia .

TABLE OF CONTENTS .

Illustrations .

1

EDITORIAL NOTES AND COMMENTS .

Conferences .

Jan. 8, 1909: — The New Year is always a time for making good resolutions, and the members of the A.E.A., present at Beinn Bhreagh, have come to the conclusion that it would be a good plan in the future that the desultory meetings they have held in the headquarters building should become regular daily meetings at 4 P.M., to talk over the work of the Laboratory and that a journal should be kept recording the points discussed.

The first regular conference was held Wednesday Jan. 6; present, the Chairman Dr. A.G. Bell, and Mr. F.W. Baldwin. Also Mr. William F. Bedwin, Superintendent of the Laboratory, and Mr. Gardiner H. Bell, Asst. Editor of the Bulletin.

Mr. J.A.D. McCurdy, Secretary of the A.E.A., arrived at Beinn Bhreagh this morning (Jan. 8) and was present at the third conference held this afternoon. A.G.B.

“Where are we at” .

Jan. 11, 1909: — Where are we at! It will be a good plan for us to look back over the line of experiments to see clearly at what point we have arrived and what are the chief points we have now to consider. This is more particularly necessary now because we have arrived a y t a period of depression. We have had our ups and downs and we have now arrived at a point when we are, all of us, decidedly down.

2

2 Curtiss has had an aggravating time with his engine.

McCurdy couldn't fly his “Silver-Dart” when he had important witnesses present and the “Loon” failed to rise from the water.

Baldwin has been unable to get his new hydrodrome, the “Query”, to rise on her hydro-surfaces.

I have planned Drome No. 5 to carry a man and an engine of the weight of a man, and the engine for which I have been waiting weighs two or three men, so that there does not seem much prospect for flying the machine as a kite as intended.

Now there is one thing that strikes me in looking back over our difficulties. That we have, all of us, struck the same snag — a difficulty in propulsion. This subject then should, I think, be carefully considered and discussed by us. I am not myself familiar with the subject of motors and therefore submit with diffidence a few elementary thoughts for discussion, relating to the propulsion of a flying machine; and I have asked Mr. McCurdy to prepare also a short statement of certain views he has expressed to me upon the same subject which appear to me to be novel and to be very important if well founded. A.G.B.

McCurdy's proposition relating to Propulsion .

Jan. 11, 1909 :— As I get McCurdy's idea it is this:—

(1) Given a weightless aeroplane of a specified area and tilted up in front at a specified angle it will take a certain propeller thrust to move it horizontally against the resistance of the air at a specified speed.

3

(2) If this weightless aeroplane travels horizontally through the air at the specified velocity and with the specified inclination it will be capable of supporting a certain load.

(3) It will take m no more power to drive the loaded aeroplane at the supporting velocity than to drive the unloaded one. The propeller thrust will be the same in both cases.

This is an important proposition if true. A.G.B.

4

Telegrams from Members .

Curtiss to Bell.

Hammondsport, N.Y., Jan. 1, 1909: — Ex e p ect to try “Loon” today. Have seventy miles pitch speed, and two hundred and seventy-five lbs. pull. Seven and one-half foot propeller. Direct drive. Revolutions nine hundred and sixty.

(Signed) G.H. Curtiss

Curtiss and McCurdy to Bell .

Hammondsport, N.Y., Jan. 2, 1909:— Gave vaudeville performance to-night by moonlight with “Loon”. First hydro test successful, second aerodrome test fairly successful, third submarine test most successful of all. Experiments ended.

(Signed) Curtiss and McCurdy.

Bell to Curtiss and McCurdy.

Baddeck, N.S., Jan. 4, 1909: — Sorry for vaudeville performance. Hope McCurdy O.K. Patent matters at a standstill waiting your arrival here. Please come on at once.

(Signed) Graham Bell.

Curtiss to Mrs. Bell .

Hammondsport, N.Y., Jan. 4, 1909: —Everything right here. McCurdy left to-day via Toronto. Have written.

(Signed) G.H. Curtiss.

Curtiss to Bell .

Hammondsport, N.Y., Jan. 5, 1909: —Will come at once if absolutely necessary; but have to return by the fourteenth for Director's Meeting, and other important business. See letter. You have my proxy in patent matters.

(Signed) G.H. Curtiss.

McCurdy to Bell .

Truro, N.S., Jan. 7, 1909: — Arrive at Iona by Sydney Flyer to-night.

(Signed) J.A.D. McCurdy.

5

2 Bell to Curtiss.

Baddeck, N.S., Jan. 12, 1909 :—Your presence necessary to determine the names to be signed to the application for a patent. No proxy will meet the case. Please come immediately after your Director's Meeting if possible.

(Signed) Graham Bell.

Bell to Mauro, Cameron, Lewis & Massie .

Baddeck, N.S., Jan. 12, 1909 :— Hammondsport members made no comments on specification. Please forward amended claims for our consideration as to names of inventors. All members will be here at the end of this week.

(Signed) Graham Bell.

6

Curtiss to Mrs. Bell .

To Mrs. A.G. Bell, Baddeck, N.S.

Hammondsport, N.Y., Jan. 2, 1909 :— John is planning to leave this afternoon for Baddeck, although we have not had an opportunity to try the “Loon”. Everything has been ready now for some time awaiting favorable weather conditions.

Lucien and his school-mate were here for a day or two last week, and I believe John is going by way of Toronto. I am sorry we could not have made the tests with the “Loon”, but it is pretty slow business in the winter time when you have to wait a week or more at a time for a good day and then something may happen to prevent a successful trial. We are preparing to ship the “Silver-Dart” to Baddeck. The crates are made and we will start taking it down to-morrow. We have delayed this a little thinking we might get a chance to give it another trial. There has been a lot of problems, especially with propellers, which were hard to figure out.

We have had no trouble with the engine of late, except for the freezing up at the time Mr. Bell was here; in fact, the only real engine trouble we have had was the cylinders blowing off. We will bring the engine to the shops and give it a thorough test before shipping it to Baddeck. We have kept the motor in one machine or the other nearly all of the time, and have not had any opportunity to make any long runs. As soon as this can be done I will come to Baddeck.

(Signed) G.H. Curtiss.

7

Curtiss to Bell .

To A.G. Bell, Baddeck, N.S.

Hammondsport, N.Y., Jan. 9, 1909 :— Since reading in the last Bulletin about Baldwin's brake test of the four cylinder motor, I am convinced that it will be best to make a thorough test of the eight cylinder before shipping it to Baddeck. We will also test a motor similar to the one you have as it is evident that Baldwin was not getting full power, although 10 H.P. at 1000 is not so bad considering that the engine at the time would speed only to 1400 idle.

All the parts of the “Silver-Dart”, together with materials, tools, silk, etc., belonging to the Association, went forward by express Jan. 6th. After reaching Bath it was found necessary to send by freight as far as Niagara Falls on account of the size of the package. If the Canadian Express cars will accommodate it, it will go by express from there, otherwise it will go all the way through by freight.

(Signed) G.H. Curtiss.

8

TRIAL OF THE LOON, JAN. 2, 1909: By J.A.D. McCurdy.

Beinn Bhreagh, Jan. 9, 1909 :— On January 2, 1909 the “Loon”, fitted with its hydro-surfaces, was taken from the shed over to the head of the Lake. After she was placed in the water between her docks the engine was started by Mr. Curtiss and the operator's seat taken by McCurdy. At the signal to let go she started sluggishly forward, and after running for about 100 yards rose on her hydro-surfaces with the pontoons completely out of water.

Immediately it was noticed that instead of running smoothly as was anticipated, gradually gaining in speed, a tremendous commotion was created in the water by the hydro-surfaces, and the maximum speed attained by the machine seemed to be about 8 or 10 miles an hour.

After running down the Lake for a short distance the machine showing no increase of lift, the engine was accidentally shut off by the breaking of an electric wire; there being no wind, however, she was easily towed back to the dock by means of a row-boat.

Newspaper men on shore reported that the machine was seen flying over the Lake and were very enthusiastic about what they thought a flight. Their impression, however, was derived from the fact that, although the boats themselves were out of the water, they didn't realise that the hydro-surfaces were still on the water.

We were satisfied by this time that the hydro-surfaces, as had already been suggested by Mr. Bell, were “ten 9 2 times too large”. They had been made to fit to the boats in sockets so that they could be easily removed. With the aid of this construction and the help of a saw the hydro-surfaces were entirely removed from the boats.

The first trial had been made after five o'clock in the afternoon and it was, therefore, quite dark; but by the time everything was in readiness for a second trial the moon had come up and the whole Lake flooded with light.

About seven o'clock the second trial of the “Loon” without hydro-surfaces was made. As she shot from the docks after the signal was given to let go, I felt a sudden jar and realized at the time that she had struck something projecting from the docks, however thought nothing more about it at the time as in a second or two we were well out on the Lake. She had her old speed back again this time and, although not measured, seemed to be about the same as in former experiments (27 miles an hour).

The course taken was about half a mile down the Lake, turning and coming back. By this time the wind had risen to about, I should judge, 15 miles an hour, and so, before the row-boat could get up to me, I drifted to leeward of the dock about 100 feet. The machine was, however, easily towed to the dock, canal boat fashion, men walking along the shore pulling by means of a rope. No sooner, however, had we brought her abreast of the piers (the port pontoon being adjacent to the piers) than she began to sink, the starboard boat and 10 3 wing going completely down in about 12 feet of the water.

The boat had sprung a leak, that was a certainty, and it was a question among the men at the time whether the leak was caused by the jar as she was let go from the docks or whether I had run into some floating ice which was quite abundant. By means of rope and pries the “Loon” was hauled from the water without causing any damage to the machine, and investigation showed that the stern post of the starboard pontoon had been entirely ripped out by coming in contact with one of the posts of the piers as she was getting away. This left a hole about 18 inches high by 4 inches broad. While the machine was kept under way the water found no time to enter this hole but as soon as the machine was brought to a stand-still the water poured in and as it was comparatively dark it was unnoticed by the spectators.

The machine was left on the shore for the night and taken to the shed early the next morning, January 3, where she was dismantled and put away for the winter.

J.A.D. McC.

11

BEINN BHREAGH EXPERIMENTS: Reported by the Editor.

Drome No. 5 .

Jan. 4, 1909: — Aerodrome No. 5 has been still further strengthened by wiring from the ridge-pole to the keel stick, and by putting tension wires in at other parts of the structure. The two banks of cells which had been prepared to fill in the spaces on either side of the central body frame (see Bulletin XXIV p. 46) no longer fit, on account of the heavy beading there and Mr. Baldwin recommends omitting them altogether and substituting some open framework which will not interfere with the aviator's view below and on either side. He thinks the aerodrome is now sufficiently strong, and he tested its rigidity to-day by getting into it while it was supported from below at only four points four meters apart, there being no support directly beneath the center. He reports that the whole structure seemed solid and stood his weight of 175 lbs. perfectly well. The aerodrome is now ready to receive the engine bed and propeller which will now be fitted in. A.G.B.

Testing the Stability of the “Query” .

Jan. 4, 1909 :— Experiments were made to-day in Beinn Bhreagh Harbor to test the stability of Baldwin's new hydrodrome “The Query” without any hydro-surfaces upon her. The engine had been provided with a balance wheel of smaller diameter than before so that it could be placed nearer the bottom of the boat thus lowering the center of gravity. The process 12 2 of testing was as follows:—

The “Query” was hauled over on her beam ends in the water until a position was reached such that a very little further tip would have upset her. She was held steadily in this critical - p osition of unstable equilibrium while a plumb-line was dropped from the top of the structure to the water to ascertain the vertical height of this point. The horizontal distance of the plumb-line from the boat at the water level was also measured, so as to obtain horizontal and vertical readings from which the angle of tip could be calculated.

With Mr. Baldwin on board the critical position was reached when the base-line measured 23 inches, and the plumb-line 41 inches. Without any one on board the base-line measured 18 inches and the vertical 41. A.G.B.

First Trial of the “Query”.

Jan. 5, 1909 :— On account of ice in Beinn Bhreagh Harbor and Baddeck Bay it was necessary to carry the “Query” over to the Central Wharf to reach open water. Here she made her first trial to-day. It is also noteworthy that this was the first time an attempt had been made to steer a boat with the rudder in the bow instead of in the stern. The aerial rudder formerly used on the Dhonnas Beag was employed. It measured three feet by three and was placed five feet from the bow. There was no submerged rudder.

Propellers :— Two propellers were employed 88 inches in diameter, 22° 30‘ at tip; gearing 8:24.

Weight :— Total weight 647 lbs, (Hull with surfaces etc 225 lbs, engine and frame 173 lbs, propellers and chain 60 lbs, battery and coil 14 lbs, Mr. Baldwin 175 lbs, total 647 lbs).

13

3 Hydro-surfaces :— Two sets forward 5 feet from bow, one set aft five feet from stern. Each set consisted of three blades, curvature 1:15, spaced 6 inches apart, and the hydro-curves were all set at an angle of 5 degrees. The blades were all 3 3/16 inches wide from fore to aft. In the front sets the top blades were 30 inches long from side to side, the

middle blades 24 inches and the bottom blades 18 inches. In the after set the top blade measured 26 inches from side to side, the middle blade 24 inches, and the bottom blade 18 inches.

Exp . 1 The “Query”, running under her own power with double propellers covered 100 meters in 28 seconds.

The engine however was not running very well. The “Query” did not lift out of the water, although her bow lifted to about midships. The stability was all that could be desired, but the aerial rudder did not steer her. This was probably due to the fact that the rudder had been placed almost directly over the front set of hydro-surfaces which would naturally prevent her from turning. In this experiment the auxiliary ports of the engine were open.

Exp . 2 The auxiliary ports were then closed and the engine did much better; but, as the rudder was useless, no estimate of speed could be taken. During the course of this experiment Baldwin shifted his position as far forward as possible to correct the lifting by the bow. This improved the longitudinal balance but the boat did not rise clear of the water.

Exp . 3 The hydro-surfaces were then removed and the “Query” tried again without them. The speed was much improved but no measurements were made. Baldwin thinks it was probably more than 15 miles an hour. Steering however proved to be 14 4 impossible althoug g h in this case there were no hydro-surfaces to interfere with the steering action. The omission of the hydro-surfaces materially impaired the stability of the boat. A.G.B.

Flexible hydro-surfaces on the Dhonnas Beag .

Jan. 5, 1909 :— The Dhonnas Beag no longer being needed for Baldwin's experiments, she was to-day fitted with flexible hydro-surfaces as suggested in Editorial Oct. 17, 1908 (see Bulletin XVI pp 8–9).

Mr. Bedwin designed and made the hydro-surfaces from the general description given in the Editorial, and without any specific instructions concerning dimensions etc. He has supplied the following details illustrated by a blue print.

Dimensions :— Hull 20 ft. long; distance between the trusses supporting the hydro-surfaces 8 ft. 6.5 inches; normal angle made by the hydro-surfaces with the deck of the boat 60°. There were six hydro-surfaces in the front set, and two in the after set — made of wood.

In the front set the outer pair of surfaces were 4 feet 9 inches long and two and a half inches wide. They were 11/16 of an inch thick at the top tapering to 3 /16 of an inch thick at the bottom. The intermediate pair were four feet long, two and a half inches wide, and # of an inch thick at the top tapering to 3/16 of an inch thick at the bottom. The inner pair were three and a half feet long, two and a half inches wide, and # of an inch thick at the top tapering to 3/16 of an inch at the bottom.

In the after set there was a single pair each four feet nine inches long, two and a half inches wide, and 11/16 of an inch thick at the top tapering to 3/16 of an inch thick at the bottom.

Weight :— Total weight of Dhonnas Beag fitted with flexible hydro-surfaces 200 lbs. (Hull 90 lbs, outriggers and floats 28 lbs, forward truss and attached hydro-surfaces 41 lbs, after truss and hydro-surfaces 26 lbs, piece of iron used to balance boat properly 15 lbs, total 200 lbs).

15

FORWARD SET SURFACES. set same as forward set with only one (the outer) surface on each side Flexible Hydro Surfaces on “Dhonnas Beag” WFB ?? 1908

16

5 Experiment :— The S D honnas Beag provided with flexible hydro-surfaces as above described, was taken to-day (Jan.5) to the Central Wharf and launched upon Baddeck Bay. She was then towed by the Gauldrie, and the following observations of speed and pull were made.

Speed Pull

100 m. in 39 sec. 95 lbs.

100 m. in 42 sec. 100 lbs.

100 m. in 40 sec. 100 lbs.

100 m. in 37 sec. 90 lbs.

100 m. in 39 sec. 95 lbs.

Aggregate 500 m. in 197 sec. 480 lbs.

Average 100 m. in 39.4 sec. Pull 96 lbs.

The Dhonnas Beag did not succeed in rising clear of the water on her flexible hydro-surfaces. She rose however every time the towing-line was pulled rapidly in by hand showing she was near her supporting speed.

It became obvious that the whole arrangement was too heavy to be supported upon these surfaces at the speed of the Gauldrie and it was decided to attach them to a light frame instead of the Dhonnas Beag and try them again another day. A.G.B.

Second Trial of the “Query” .

Jan. 9, 1909 :— In the experiments (Jan.5) the “Query” had failed to rise out of water, indicating that her submerged surfaces were not large enough. She had been provided with three sets of hydro-surfaces two at the bow and one at the stern, and she had shown a tendency to rise at the bow more than the stern. It was then decided to increase the area of her submerged surfaces by giving her another set at the stern.

17 use 138175-4 (c192)

18

6 To-day (Jan.9) she was tried with four sets of hydro-surfaces like those described in notes Jan.5, two in front and two behind (see photographs in this Bulletin).

Exp . 1: — The "Query" made a run from the Central Wharf under her own motive power propelled by two propellers as on the former occasion (Jan.5). She did not seem to go at any great speed the hydro-surfaces seeming to act as a drag more than a help: Nor did she rise from the water.

It is somewhat remarkable that so far even in Baldwin's most successful experiments with the Dhonnas Beag, with the boat well out of water, and with only the hydro-surfaces submerged, no great speed has been obtained. In fact the speed without the hydro-surfaces has been greater than with them. The same thing seems to be true of the "Query". We only hope that the new Curtiss engine we expect from Hammondsport may give us sufficient power to make these small surfaces show what there may be in them. With our present engine power it is obvious that we cannot lift the "Query" out of the water without enlarging the area of the submerged surfaces which is inadvisable from the speed point of view, or without lightening the boat which is impracticable.

Exp . 2: — An experiment was made to ascertain whether the boat would rise out of the water at the speed of the Gauldrie if relieved of the weight of the engine and man. The engine was taken out of her, and the empty hull towed by the Gauldrie at a speed of about seven miles an hour. The speed proved to be insufficient and she did not rise. The pull on the towing-line was steady at 40 lbs.

19

7 It is hoped that better results may be obtained with the new engine, but we can hardly expect different results with the present engine unless we use larger submerged surfaces. A.G.B.

Flexible hydro-surfaces upon "The Crab" .

Jan. 9, 1909 :— The "light frame" decided upon for the flexible hydro-surfaces Jan. 5 in place of the Dhonnas Beag turns out to be not so very light after all. Weight 146 lbs. It consists of a rough wooden framework made of thick boards to which the trusses carrying the flexible rods are attached. It is a very clumsy crude contrivance and when it was placed upon the Central Wharf to have its photograph taken we all laughed heartily at the ridiculous appearance it made wobbling about on its flexible legs and named it at once "The Crab". (See photograph in this Bulletin)

When the "Crab" was placed to-day in the water it floated low not being provided with special floats. When towed by the Gauldrie however, the framework rose out of the water about 18 inches supported upon its flexible hydro-surfaces (see photograph in this Bulletin). Pull about 70 lbs.

When we look at the crude construction of the present apparatus and note that it rose out of the water at the low speed of 7 miles, one cannot avoid wishing to see the experiment tried again with a more carefully made machine. We cannot interrupt more important experiments, but we may perhaps be able to spare time to test an apparatus possessing a large number of thinner and more flexible rods, a 20

21 8 regular tooth-comb sort of arrangement, making up in number of rods for the weakness of the individual members. In order to have flexibility the rods should individually be thin and supple, and the load should be distributed through a large number of them, instead of being concentrated upon a few as in the eight-legged "Crab". A.G.B.

THOUGHTS CONCERNING PROPULSION: By J.A.D. McCurdy.

Jan. 11, 1909 :— To get an idea of the carrying power of the “Silver-Dart” and of the propeller thrust required to maintain the machine in flight I employed the tables and figures give us by Langley and Lilienthal and arrived at the following results.

Assume a speed of travel relatively to the air of 35 miles an hour.

The machine flies at an angle of attack of 6° and there are 420 sq. ft. of supporting surface. The equivalent flat surface of the machine from its structural point of view including the surface area which the operator and power plant present amounts to 17.94 sq. ft.

Under these conditions the machine will support a total load of 1424 lbs. and the propeller thrust required would be 192.9 lbs.

We are only causing the machine to carry 860 lbs. Is this an economical state of affairs or not, or could we just as well carry the full capacity of the machine from our theoretical conclusions?

In general terms here is the proposition. Suppose a purely theoretical plane — which will be weightless — to advance horizontally through the air at a given speed and maintaining a definite angle of attack. The reaction of the normal pressure of the air on this plane will produce two results which we call lift and drift.

The plane travelling horizontally at this angle of 23 2 attack and at the p s peed will necessarily support a certain definite load.

The plane traveling horizontally at the angle of attack and at this speed will require a definite propeller thrust.

Now ? d o we gain anything in efficiency by having our machine weigh less than the carrying power of the planes. The only difference noticed by the spectators at Fort Meyer, between the flight of the Wright machine when carrying one man, and carrying two men was that the machine took longer to acquire its necessary speed before taking the air, when it carried two men, because its mass was then greater than with one man.

The propeller push was just the same in both cases, and the speed of the machine when flying was the same in both cases.

QUERY :— Does the flying machine adjust itself automatically in reference to the angle of attack according to the load which it is required to lift.?

J.A.D. McC.

24

THOUGHTS CONCERNING PROPULSION FROM THE STANDPOINT OF PURE PHYSICS: By A. G. Bell.

Jan. 11, 1909: — All flying machines depend for their propulsion upon the inertia of the air.

The usual method of propulsion consists in pushing air backwards by means of an extended surface, or propeller blade. The reaction then pushes the machine forwards.

In order to typify the essential action in its simplest form, imagine a couple of balls with a compressed spiral spring between them. In this conception one ball represents the machine, the other the air that is pushed backwards, and the spiral spring between them typifies the engine power employed. Release the spring, and the balls are pushed apart, the machine going one way, and the air the other.

Relatively to one another, each ball moves with the same velocity. That is: One ball moves away from the other just as fast as the other moves away from it: But, relatively to the surrounding quiescent air or to the earth, they move with different velocities dependent upon their mass or weight, the heavier body moving with slower velocity. They move in opposite directions with equal momenta (not equal velocities), which is simply another way of saying that “action and reaction are equal and opposite”.

25

2 Let M represent the mass or weight of the machine, and V its velocity: Let m represent the mass or weight of the air that is pushed backwards by the propeller and v its velocity: And let the direction which the machine moves be considered as + and the opposite direction as -: Then $M(+V) = m(-v)$ or:—

$$MV = -mv$$

Our object is to propel the machine at a certain velocity sufficient to sustain it in the air. The values of M and V are therefore fixed. The machine has a certain known weight or mass (M) and must acquire a certain known velocity (V) in order to be self supporting. Our problem then is to obtain values for m and v such that MV = — mv.

We have two elements here to consider: m, the mass or weight of the air pushed back by the propeller and v, the velocity of the displaced air.

If the weight of the displaced air is equal to the weight of the machine, then the velocity of the displaced air will be equal to the velocity of the machine. If m is less than M, then v will be greater than V; and vice versa .

From the standpoint of pure physics we have only two elements to consider, m and v; but from the mechanical point of view we have three elements that produce and control the motion of the displaced air.

Considering our propeller as forming a portion of a perfect screw having the same pitch from center to circumference the three mechanical elements involved are:— 26 3 (1) The amount of surface in our propeller blades; (2) The pitch of the propeller; and (3) The speed of its rotation.

It may be we e l l then to translate the two physical elements m and v in terms of the surface, pitch, and speed of rotation of the propeller.

Value of m

Surface :— The value of m varies directly with the surface of the propeller. Keeping the pitch and speed of rotation constant then the larger the surface the greater will be the mass of air pushed back by it, and proportionally greater.

Pitch :— It also varies directly with the pitch. Keeping the surface and speed of rotation constant the greater the pitch the greater will be the mass of air pushed back at each rotation, and proportionally greater.

Rotation :— It also varies directly with the speed of rotation. Keeping the surface and pitch constant then the greater the speed of rotation the greater will be the mass of air thrown back per second, and proportionally greater.

Value of v .

Surface: — The value of v does not depend at all upon the surface of the propeller.

Keeping the pitch and speed of rotation constant then the larger the surface the greater will be the mass of air thrown back by the propeller, but the velocity of the displaced air will not be affected.

27

4 Pitch :— The velocity of the displaced air varies directly with the pitch.

Keeping the surface and the speed of rotation constant then the greater the pitch the greater the velocity of the displaced air and proportionally greater. For example:— Suppose the propeller to make one rotation per second; then, if the pitch is one meter, the velocity of the displaced air will be one meter per second. If the pitch is two meters, then the velocity will be two meters per second etc.

Rotation :— The velocity of the displaced air varies directly with the speed of rotation.

Keeping the surface and pitch of the propeller constant then the greater the speed of rotation, the greater will be the velocity of the displaced air and proportionally greater. For example:— Let the pitch of the propeller be one meter, then if the propeller rotates once per second the velocity of the displaced air will be one meter per second. If it rotates twice per second the velocity will be two meters per second etc.

It is noteworthy that the value of m depends upon all three elements, surface, pitch and speed of rotation; whereas the value of v depends upon only two — the pitch and speed of rotation. Variations in the amount of surface can only affect the amount of air thrown back and not its velocity.

28

Value of mv .

Surface :— The propelling force (or mv) is directly proportional to the surface of the propeller.

Keeping the pitch and speed of rotation constant the greater the surface the greater the mass (m) of the displaced air, but its velocity is unchanged, so that changes in the amount of surface affect only the m element of the propelling force mv. Thus the total value of mv varies directly as the surface.

Pitch :— The propelling force mv varies directly as the square of the pitch.

Keeping the surface and speed of rotation constant then the greater the pitch the greater the mass (m) of the air thrown back and the greater its velocity (v). Thus both the m and v elements vary with the pitch. If we double the pitch we move twice the mass of air at double the velocity and the value of mv is four fold etc.

Rotation :— The propelling force or mv varies directly as the square of the speed of rotation.

Keeping the surface and pitch constant, then the greater the speed of rotation, the greater will be the mass (m) of the air thrown back and the greater its velocity (v). Thus both the m and v elements vary with the speed of rotation. If we double the speed of rotation we move twice the mass of air at double the velocity; and the value of mv would be four fold etc.

29

6 Thus the value of mv varies in simple proportion to the surface of the propeller, and in double proportion to the pitch and speed of rotation.

Does this indicate that great pitch and great speed of rotation, rather than great surface, is what is wanted in the propeller of a flying machine? A.G.B.

30

Extracts from "Marine Propellers" : By F.W. Baldwin.

A few points taken from Mr. Barnaby's book on Marine Propellers* seem to be directly applicable to aerial propulsion. F.W.B.

* Marine Propellers by Sydney W. Barnaby (Spon and Chamberlin, 12 Cortland St. N.Y. 1900).

(p.1) The principle upon which nearly all marine propellers work is the projection of a mass of water in a direction opposite to that of the required motion of the vessel.

If the weight of the mass of water acted upon by the propeller in pounds per second = W, and if the sternward velocity in feet per second impar e t ed to it in relation to still water = S, then the reaction which constitutes the propelling force is WS/g where g = 32.2 feet per second; and this is independent of the form of propelling apparatus altogether. S is commonly known as the real slip, but will here be generally referred to as the rate of acceleration, or more shortly, as the acceleration.

When the vessel is in motion at a regular speed, the reaction WS/g is equal to the resistance.

So long as there is a resistance to be overcome by the propeller, there is no possibility of reducing the real slip or acceleration S to zero, since a necessary condition would be that W, the weight of water acted upon, was infinitely large.

31

2 When a propeller is to be designed for any given set of conditions, it is of the first importance that the relation between the mass of water acted upon and the acceleration imparted to it should be such, That while the product WS/g shall equal the estimated resistance of the ship, and the size and rate of motion of the propelling apparatus such as shall suit the conditions of the case, the economic result may yet be the best attainable, or may only fall short of the maximum by an amount which is calculable, and which it may be desirable to sacrifice in order to obtain other advantages.

(p. 3) There is a certain quantity of work which must be lost under all circumstances, and it is equal to the amount of energy of the discharged water moving astern with a velocity S relative to still water.

As this energy varies as the weight multiplied by the square of the velocity, it follows that if the quantity of water acted upon is doubled, the loss from this cause is doubled, but if the acceleration is doubled, the loss is increased fourfold. This explains why the hydraulic propeller, which is forced to act upon a much less area of column than the screw, appears at such a disadvantage when compared with it.

Pulling versus Pushing .

(p.44) In the well-known Mersey ferry boats there are four screws, but in some of those built in America two only are employed, one forward and one aft, driven by the same shaft, an arrangement which appears to be inferior. 32 3 The forward screw of one of these latter vessels was estimated to augment the resistance of the hull by 23.5 per cent and its propelling efficiency was only 43 per cent of that of the after screw.

Negative Propulsion .

(p.46) If a screw is placed behind a stern so bluff that the supply of water is impeded, it will draw in water at the center of the driving force and throw it off from the tips of the blades like a centrifugal pump. It is recorded that an attempt to propel a square-ended caisson by means of a screw resulted in the caisson going astern, which ever way the screw was driven.

Inclination of line of Thrust .

(p.47) There is a disadvantage connected with an inclined screw shaft which points to the advisability of placing the shaft nearly horizontal as possible.

The result of depressing the end of the shaft is to cause the effective pitch to vary through every part of the revolution. If the inclination be supposed to be 45° for example, that part of the blade which is intended to have a pitch of three diameters has in reality an effective pitch varying from nothing to infinity.

It is of course obvious that the pitch of the blades in relation to the axis is unchanged by any al ? t eration in the direction of the shaft, but whatever the pitch in relation to the axis may be, if the axis were to pass vertically out through the bottom of the ship, the virtual or effective 33 4 pitch, measured in the direction of motion is nil. If a screw does not move along but has a motion of rotation only the resistance of the water to the blades is the same whatever be the direction of the shaft; but if the propeller be allowed to move forward, while at the same time it be constrained to move horizontally, the shaft being inclined to the horizontal, then the resistance of the water to the blades is not uniform, but varies over every part of the revolution. This will perhaps be made clearer by an examination of the phases through which a blade passes during one revolution. It is convenient and suitable to consider the action of a screw as similar to that of an inclined plane moving past the stern.

Fig. 21

Fig. 22

Fig. 23

In Fig. 21 the full line represents the upper blade as a plane moving from port to starboard; the dotted line represents the lower blade as a plane moving from starboard to port.

In Fig. 22 the shaft is horizontal and the full line shows the blade going down, and the dotted line the blade coming up.

34

5 In Fig. 23 the shaft is inclined at 45°, the full line again showing the blade going down, and the dotted line the blade coming up. As the ship moves forward the water may be supposed to flow to the screw in approximately horizontal lines, and the blade which at one part of the revolution is edgewise to the water, at another is square on to it, and the result is an irregular pressure causing vibration. Another way of looking at it is this: A particle of water meeting the ascending blade has its motion relative to the vessel arrested completely, while a particle on meeting the forward edge of the descending blade would require to have its velocity infinitely accelerated in a horizontal direction, to enable it to

escape from under the blade. This is what is meant by saying, that in the above example, the effective pitch varies from nothing to infinity during each revolution.

Variable Pitch .

(p 49) When the length of the propeller in the direction of the axis is small, that is, when the blades are narrow, there is probably not much to be gained by departing from a true helical surface, or what is called a uniform-pitch; but when the bla ed de s are wide the pitch should increase in the direction of the length of the propeller, that is, the after edge of the blade should have a coarser pitch than the forward edge. The reason for this may be seen by referring to Fig. 8.

35

6 The column of water passing through the screw is contracting in area and increasing in velocity.

Blades of uniform-pitch would only be strictly appropriate if the column while passing through the screw were parallel and maintained a constant speed.

If the length of column occupied by the screw is sufficient to allow a sensible contraction to take place within its limits, then the pitch of the screw surface should augment at the same rate as the speed of the column of water is accelerated, in order that all parts of the blade may keep touch with it during its passage. It was an early practice introduced by Woodcroft to vary the pitch in this manner (see p. 21), the supposition being that by so doing a gradual acceleration would be produced and not a sudden one. It is probable that in no case could water be accelerated suddenly by a submerged propeller, and all that is required is that the surface of the screw should be adapted as nearly as possible to the rate of flow through it, which rate is determined by the mean pitch of the screw surface. What the variation on each side of the mean should be is very difficult to say, as it has not yet been determined at what distance ahead of the screw acceleration of the water commences, or at what distance astern it is completed, and the full velocity or race attained.

Although we know that the vena contracta of the race must be somewhat of the form shown in Fig. 8, it is not possible at present to define its boundaries, and it can therefore only be stated in general terms that the greater the 36 slip ratio the greater would be the contraction, and consequently the greater should be the variation of pitch on each side of the mean. Since the slip ratio at a given efficiency increases with pitch ratio, the variation should also bear some proportion to the pitch ratio. As the use of wide blades is frequently associated with high slip ratio, as for example, when diameter is restricted by the draught of water, not only do they occupy a considerable length of the contracting column Fig. 8, but also the amount of the contraction is greater; and if this reasoning is correct, there is a twofold advantage to be gained by giving an increasing pitch to screws with wide blades.

Propeller Balance.

(p. 51) In order to prevent vibration from being set up by the propeller in long fine vessels of high power, two things should be considered. The propeller should have a good running balance, and the center of pressure should be in the center of the disc. To ensure that the first condition is realised, each blade must be of the same weight, and the center of gravity of each must be at the same distance from the axis of the shaft. To satisfy the second condition is more difficult. If the screw works in undisturbed water and the surface of each blade is disposed symmetrically about the shaft, then the center of pressure will be in the center of the disc if the screw is caused to advance in the direction of the line of its shaft.

Any inclination of the shaft from the line of advance tends to throw the center of pressure out of the center of 37 8 the disc, for the reason already explained (see page 48), and the same effect is produced to some extent by the inequality of the onward motion of the water in the frictional wake in which thepropeller works.

THE OUTLOOK ON AVIATION: by Asst. Editor.

An extract from Major Squier's speech delivered before the American Association of Mechanical Engineers is given in the Scientific American for January 2.

Items from Newspapers .

Santos Dumont vouchsafed the following information in connection with his monoplane, to a reporter on the Paris edition of the London Mail:— “I have entirely abandoned the bi-plane system of aeroplane in favor of the monoplane which I consider has immense advantages over the former. The one I have constructed in my shed at Neuilly, is extremely light. Its weight when completed will not exceed 150 kilograms including the motor. As I do not weigh more than 50 kilograms myself you will see that the total weight it will have to lift will not exceed 200 kilos. I expect it to be very rapid, for the initial speed I will require to leave the ground will be 36 miles an hour. My propellers will revolve 700 revolutions to the minute. My motor is 24 H.P. The entire machine is only 15 ft. in width. Its total surface is 9 square yards. I have already experimented with the machine over a distance of 400 yards while in its incomplete state and with very satisfactory results. Most decidedly I shall enter for the Daily Mail Cross-Channel prize if my machine comes up to expectation, but for the present, at any rate, I have no intention of trying to break anybody's record.

39

2 Paris, France, Dec. 9 :— Twenty-eight Wright aeroplanes have already been sold at the Aeronautic salon which close s d to-morrow night after a week's existence. The machines were ordered mostly by rich amateurs at $5000.00 a piece. They will be constructed by the French Society of Aviation at Dunkirk.

Paris, Jan. 2, 1909 :— The airship show has closed in a blaze of glory, with Wilbur Wright in his machine reaping the greatest praise.

Mr. Wright being asked to give his opinion as to the future of aeroplanes said:— “It is impossible to predict, you know the fate of prophets. I do not however expect to see the aeroplane come into commercial use soon”.

New York, Dec. 31, 1908: — Mark Antony, an inventor, has perfected a dirigible balloon which can be operated by wireless electricity. By a combination of dots and dashes Mr. Antony says a change can be effected in the movements of his balloon in two seconds.

Le Mans, Saturday, Jan. 2, 1909: — Mr. Wilbur Wright to-day held his last trial here. He then took down the aeroplane which will be transported on Monday to the Hallee Works where it will be taken apart and sent to Pau. Mr. Wright expects to stop at Pau for a few weeks only.

Rome, Dec. 26, 1908 :— The date for trials to be made here by Wilbur Wright with his aeroplane has not been fixed, but it will probably be next month. Instead of flying on a level with the ground the aeroplane will start from the 40 summit of Monte Mario, a hill over looking the parade ground, and the flight will be over the right bank of the Tiber, where the buildings are low.

New York, Jan. 4, 1909: — A Swedish inventor, Oscar Ostergren, designer of the U.S. torpedo boat Bailey is building a flying machine. It will be completed at Worcester, Mass. by the end of the month. The papers do not say of what type this machine will be. G.H.B.

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXIX Issued MONDAY, JAN. 25 1909

ASSOCIATION'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell Assistant Editor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO.XXIX ISSUED MONDAY JAN. 25, 1909 .

Beinn Bhreagh, Near Baddeck, Nova Scotia .

TABLE OF CONTENTS .

1

The Antoinette V .

Jan. 21, 1909 :— The new aerodrome Antoinette V reported in the Outlook is remarkable in this, that its framework seems to be constructed throughout upon the tetrahedral plan. In L'Aeroph u i le Jan. 1, 1909 p. 7, the author says:—

“Dans cette construction basée sur le triangle et la pyramide, (Tetrahedral construction) les matériaux ne travaillent qu' à la traction et à la compression, sans qu'il puisse jamais y avoir flambement.

C'est le principe meme de la construction des ponts metalliques et de la Tour Eiffel. Son application à la construction des ailes d'aéroplane, a permis d'obtenir une rigidite et une solidité absolues, alliées à la plus grande légèreté possible”.

A.G.B.

2

ACTION OF CITIZENS OF BADDECK RESPECTING THE FREE ENTRY OF THE “SILVER-DART”: Reported by Wm. F. Bedwin, Supt. of Beinn Bhreagh Laboratory.

Baddeck, N.S., Jan. 21, 1909 :— The citizens of Baddeck realizing the importance of Dr. Bell's experimental work to this community felt that it would be a mark of appreciation to use their influence, as a Town, with the Minister of Customs to admit free of duty the flying machine “Silver-Dart” which is being transferred from the Aerial Experiment Association's Plant at Hammondsport, N.Y., to Dr. Bell's Estate at Beinn Bhreagh, near Baddeck. The following telegram was therefore sent to the Minister of Customs:—

Baddeck, Jan. 16, 1909 To Hon. Mr. Patterson, Minister of Customs, Ottawa, Canada.

Citizens Baddeck very anxious that you allow free entry on experimental flying machine and apparatus for Dr. Graham Bell which arrived last night.

(Signed) K.J. McKay.

To this the following reply was received:—

Ottawa, Jan. 16, 1909. To K.J. McKay, Baddeck, N.S.

Have written Collector Baddeck respecting admission flying machine.

(Signed) J.W. McDougall. Commissioner Customs.

I could not get a copy of the letter to the Collector of Customs referred to in the above telegram, but have been informed that it says in substance, that there shall be no duty charged if machine is returned within two years.

(Signed) Wm. F. Bedwin.

3

Chanute to Bell .

To A.G. Bell, Baddeck, N.S.

Chicago, Ill., Dec. 18, 1908 :— I herewith return the Late Lieut. Selfridge's paper, which displays great research and industry and is sure to win him great honor. I therefore decidedly advise its publication.

I have accordingly gone over it with much care to verify the statements and figures given and do not believe that many mistakes now remain.

I note that you propose to illustrate the paper with numerous photographs, illustrating the various forms of apparatus alluded to, and if I can be of service in indicating where they are to be found I beg that you will command me.

Mr. Herring had evidently given Lieut. Selfridge an erroneous account of the evolution of the “two-surface” machine. I have rectified this in the paper and herewith add a copy of a paper of my own which I have ample evidence to support if required.

I had occasion myself, a month ago, to prepare a list of “First Steps in Aviation” for “Aeronautics” which you will find to differ but little from those selected by Selfridge.

(Signed) O. Chanute.

4

Chanute to Bell .

To A.G. Bell, Baddeck, N.S.

Chicago, Ill., Dec. 18, 1908 :— Answering your enquiry of October 29, I now enclose a translation of the answer of my Russian correspondent, who is, I believe, a surgeon attached to the Aeronautical Park, to my request for details as to the screw propeller of Col. Ochtcheuny.

He does not answer the question which I put as to the thrust per horse-power and pressure on the blades, and I have written again for them.

You may, however, obtain some hints from the present letter as to the design of screws.

(Signed) O. Chanute.

5

Berthenson to Chanute .

St. Petersburg, Russia, Nov. 16, 1908: — It was Otto Lilienthal who first prepared the wing-like propelling screw. The idea is perfectly sound because the action of the birds wing corresponds to that of the screw; the flapping of the wing being analogous to the rotating of the screw. But it is generally ignored that this analogy must be perfect. When the ends of the primary feathers are clipped off, the bird can no longer fly. The ends of the primaries, through their elasticity produce the regulation of the stroke so that the trajectory of the wing tip describes a regular undulatory line, and hence the thrust is continuous without interruption; there are no irregularities in the movement to absorb motive power. Hence the wing-like screw must be flexible and elastic at the end. For this we must consider that elasticity of steel and of other material is inversely proportioned to the dimensions, whence it results that a wing-like screw should not exceed certain dimensions in order to be perfectly analogous to the wing of the bird.

I therefore suggest that experiments be made with a wing-like screw, elastic at the tips. This will also be done at the Aeronautic Park at St. Petersburg and the results may be compared.

I believe that speed is the only guarantee of stability both for the bird and the aeroplane. Birds attain a speed of 30 meters per second.

6

2 There are aviators who hope to obtain stability by a mixed system of construction, but the following fact militates against it. Lilienthal proved that the force which pushes a surface of one square meter vertically in the air sustains one kilo, while the modern aeroplane sustains ten kilos per square meter.

(Signed) G. Berthenson. PS. In another letter Mr. Berthenson suggests that the beetle may indicate a good type of an aeroplane, the thin membranous wings producing a partial vacuum so as to increase the lift under the concave upper wings. O.C.

7

CLAUDY TO BELL .

To A.G. Bell, Baddeck, N.S.

523 10th St., Washington, D.C., Jan. 4, 1909 :— I have your letter of December 31 in regard to the airship pictures. The enlargements which have been made for you were done by Mr. George Eastman of the Eastman Kodak Company. I heard him personally give instructions to Mr. Cline, of his finishing department, to spare no expense or effort to make these pictures the very best which the Eastman Kodak Company could turn out, and the results certainly bear out his instructions. They are, with no exceptions, the most beautiful prints possible to conceive of as coming from my negatives. Had these

enlargements been made from my negatives as a commercial piece of work, the Eastman Kodak Company would have sent in a bill for something between $150.00 and $200.00 on account of the large size of the pictures and the great care used in making them. Mr. George Eastman, however, as a matter of patriotism, declines to make any charge for the work and wishes to donate them, through you, to the Museum, as part of the collection the Aerial Experiment Association is making. It was on this account that I asked you if you would mind writing to him personally and thanking him for what he has done.

I note all that you say about the date of presentation of the collection and of the medals being as yet unsettled, and wish to say that I am at your service at any time 8 2 in the future if you wish to show these pictures at one of your Wednesday evenings, as you suggest, with such simple explanations of them as might be interesting.

It occurs to me that, while what Mr. Wright has done is so thoroughly a matter of history that every one is more or less familiar with it, there is comparatively little known about Mr. Wright himself. Several of the newspaper men became very well acquainted with him indeed, and had opportunities for association with him denied to the general public. I was among these newspaper men; and it seems to me that, in speaking of the pictures as they are shown, I could probably arouse more interest by talking of Wright as I know him than by merely going over the history which the newspapers and the magazines have made familiar to everyone.

Personally I am anticipating a great deal of pleasure in showing these pictures to you. You enjoyed the little originals so much that I am sure you will be very enthusiastic over the truly magnificent results which the Eastman Kodak Company has secured from the negatives.

Kindly remember me to Mr. McCurdy, Mr. Baldwin and Mr. Curtiss.

(Signed) C.H. Claudy.

9

Means to Bell .

To A.G. Bell, Baddeck, N.S.

Boston, Mass., Jan. 7, 1909 :— It seems to me that if the word aerodromeu is defined so as to include the dirigible balloon it will not be as useful a word as it might be.

We should still lack a word to precisely describe what we are now compelled (if we wish to be understood) to call a motor-propelled aeroplane .

(Signed) James Means

10

Jones to Bell .

To A.G. Bell, Baddeck, N.S.

New York, Dec. 31, 1908 :— I enclose some stuff dug out of the dictionary and have sent a copy to Mr. Means also.

(Signed) E.L. Jones.

Quotations from Century Dictionary and Cyclopedia Copyrighted 1902 .

Aerial Car :— A car used for traveling in the air; specifically the basket of a balloon or a car designed for an aerial railway.

Navigate :— (1) To move from place to place in a ship; sail. (2) To steer, direct, or manage in sailing, direct the course of. (Also used by extension in all its senses, of balloons and their use).

Navigation :— By extension, the act of sailing through the air in a balloon.

Airship :— Not given.

Aeronaut :— One who sails or floats in the air; an aerial navigator; a balloonist.

Aeronautic, Aeronautical :— The doctrine, science, or art of floating in the air, or of aerial navigation, as by means of a balloon.

Aeronautism :— The practice of ascending and floating in the atmosphere as in balloons.

Aerophobia :— A dread of air, that is, of a current of air. Also Aer Phoby.

11

2 Aerial Navigation :— The sailing or floating in the air by means of balloons or airships; particularly, the principles, problems, and practice involved in the attempt to pass from place to place through the air by means of balloons or flying machines capable of being propelled or steered. (Note by E.L.J.:— Words "Aerial Navigation" by latter definition could not be applied to floating in a balloon as a balloon is not steered. Definition contradictory).

Aerodynamic :— Relating or pertaining to the force of air and gases in motion.

Aerodynamics :— The science which treats of the motion of the air and other gases, or if their properties and mechanical effects when in motion.

Aerohyrodynamic :— Acting by the power of air in water. (Note by E.L.J:— Dhonnas Beag an aerohydrodynamic machine).

Aerology also Aerognosy (rare):— Branch of physics that treats of air, properties and phenomena.

Aeroplane :— A light framework, either plane or somewhat concave, covered on its under side with a fabric, used in flying machines and aerostatical experiments. Aeroplane :— A flying machine invented by Victor Tatin *** consisted of cylindrical reservoir for compressed air used to drive two air propellers, two laterally extended wings and a tail for steering. Velocity obtained, 8 meters per second at Chalais-Meudon in 1879.

Aerodrome :— Not given.

Aerodromics :— Not given.

12

3 Aerostat :— (1) A machine or vessel sustaining weight in the air; a balloon; a flying machine. (Science IV 330). (2) An aeronaut; a balloonist. (rare and incorrect).

Aerostatic :— Pertaining to aerostatics, aerostation, or the art of aerial navigation.

Aerostatics :— Science which treats of the weight, pressure, and equilibrium of air and other elastic fluids, and of the equilibrium of bodies sustained in them.

Aerostation :— Art or practice of aerial navigation; science of raising, suspending, and guiding machines in the air, or of ascending in balloons. Science of aerostatics.

Aviation :— The art or act of flying (rare).

Aviator :— A flying machine employing the principle of the aeroplane (recent).

Flying machine :— Mechanism designed to enable its user to fly or float through the air by the use of steam, electr o i city, or other motive power. (2) A machine designed to float in and propel itself through the air.

Helicopter :— Not given.

Ornithopter :— Not given.

Ornithopterous :— Having wings or fore limbs like those of a bird; bird-winged.

Ornithon :— A building in which birds are kept.

Aerobate :— To walk on air.

Aeronat :— Not given.

Aeronef :— Not given.

13

4 Volacious :— Apt or fit to fly.

Volant :— Flying.

Volation :— Faculty or power of flight.

Volitation :— Faculty or power of flight.

Volator :— That which flies.

Volery :— A place of flying.

FROM BRITISH “AERONAUTICS” for NOVEMBER, 1908 .

* Aeronautics :— In the first place, comprises aerial navigation in its entirely, without special reference to any of its branches. It may be divided into:—

Aerostatics :— the science of aerial navigation by means lighter-than-air, and

Aviatics :— The science of aerial navigation by means heavier-than-air. * Aerostation and * Aviation refer respectively to the practice of these two branches.

Aerodromics :— Is equivalent to Aviatics. (see Aerodrome)

* Aerostat :— Refers to an ordinary spherical balloon.

* Aeronat :— Is a dirigible, motor driven balloon or airship.

* Aeroplane :— Denotes a dynamic flying machine sustained by the reaction of the air on one or more planes, propelled by propellers or similar means. The term is an unfortunate one, as it is sometimes, and justifiably, used to denote the sustaining surface alone, and as the so-called aeroplane usually comprises curved surfaces. The name has, however, become hallowed by popular use.

14

5 * Helicopter :— Denotes a flying machine consisting of one or more lifting screws with a more or less vertical axis.

* Adopted by Federation of Aero Club.

* Ornithopter :— Denotes a machine in which the means of sustentation and propulsion consist of beating wings. (Orthopter is misleading and should not be employed.

Aerodrome :— (an air runner), first used by Professor Langley, is the most suitable and comprehensive word to denote a flying machine of any kind. It should never be used in the meaning of a balloon shed. The word Aerodromics, derived hence, may be applied to the whole science of free flight.

Aerofoil :— Proposed by the same authority to denote a motorless flying machine, a glider.

(Note:— An “airship” should never refer to a flying machine, a contrivance heavier-than the air.

NOTES BY E. L. JONES .

Drome :— The definition of “hippodrome” in Century is as follows:— “Hippos, ”horse; “dromos”, a course, running. A race-course. In classical antiquity, a place in which horse races and chariot races were run and horses exercised. “Dramine”, to run.

Hippodrome is also used as a verb as “to hippodrome”, run a race in which the result is known secretly in advance by collusion. Dromedary also comes from same word. Why not an aerodrome as a place where races in the air are held. 15 Also my preference for word aerodrome as meaning any kind of gasless apparatus.

Can we do anything to have the dictionaries take up the matter and change the obsolete definitions.

A Balloon :— is anything from a football to the state barge of Siam.

Ballooner :— is one who goes up in a balloon. Balloonery is the practice of going up in balloons.

The word “motor” is now applied to the whole automobile, or its engine alone. A possible reason, this, for aviator as the machine. A motorist is the man who motors, why not an aviatorist as the man who goes in an aviator. This is certainly funny. Is there any such word as aviate, meaning to fly in a gasless machine. E.L.J.

16

SHIP CRIPPLED BY OTHER'S SUCTION.

Professor Reeve Describes Phenomenon by Which the Prinzess Irene Drove the Parima Ashore.

$46,000 Damage claimed. Mariners much interested in Accident to One Vessel Laid to Another two Hundred feet Away.

New York Herald, Jan. 15, 1909 :— What probably will go on record as a notable case in Admiralty practice was closed yesterday before Judge Adams in the United States District Court for the Southern District. It is unusual because while there was no collision between the two vessels concerned, one, it was asserted was run aground by the other when there was at least two hundred feet of water between them.

The result is ascribed by the libellant to suction, both vessels being bound out to sea at the time.

The case was that of the Quebec Steamship Company, owner of the Parima, against the North German Lloyd Company, owner of the Prinzess Irene. A.G. Thatcher, of Wallace, Butler & Brown, appeared for the Quebec Company and Mr. Larocque, of Choate & Larocque, on behalf of the Prinzess Iren's owners. The incident occurred last April in the lower bay. The Prinzess was steaming for Europe, and the Parima for the West Indies.

Just above the cage or junction buoy the Prinzess Irene, much the larger vessel, began to lap upon the stern of the Parima. Testimony was given that the Parima suddenly was drawn to starboard, her bow fell off to port, her helm 17 2 and engines became useless and she ran aground. The Prinzess Irene proceeded, the Parima getting off in a few hours, leaking and needing repairs costing $40,000 on her return to New York. This sum with $6,000 for loss of time, was the total amount claimed.

Professor Sidney Armor Reeve, of New Haven, who has made a study of the sea phenomenon known as suction, said in part:—

“When one vessel overtakes another on the same course she laps her stem over the other's stern slowly. As the overlapping continues the bow pile of the overtaking ship comes abreast of the mid-length depression of the overtaking ship and fills up. At the same time the mid-length depression of the overtaking ship comes abreast of the stern of the overtaken and draws away its water.

“The results of this is that the mid-length portion of the overtaken vessel is sucked away from the overtaking, by the depression existing in the sea level outside, while the stern of the overtaken vessel is sucked toward the overtaking, by the depression of sea level between the two at that point. This action, when once set going, deflects the course of the overtaken vessel with forces which are very great in comparison with those of rudder control. Manipulation of neither helm nor engines can then be effective for good. The ship is then like a locomotive under full speed, but off the rails. Its driver may then be able to slightly mitigate ultimate destruction, but he cannot avert it. The deflection of the vessel, too, makes the situation worse. Once 18 deflected, she can find equilibrium only when she reaches a heading at right angles to her original course, unless her headway may have meantime shot her outside the sphere of effective influence.

“In order to understand the situation fully it must be noted that the action described is not due to the bow wave of the overtaking vessel, nor to the lateral motion of the water near the stern ? (by half the vessel's beam) which is necessary in order to fill in behind the vessel. It is due to the longitudinal motion of the water aft along the mid-length.”

19

THE OUTLOOK ON AVIATION: By the Asst. Editor.

(The following has been translated from L' a A erophile).

<u>The Michelin Aviation Cup.</u> <u>The new world records of distance, duration, and height</u> : — On the 18th of December at 8 A.M. although quite a strong wind was blowing Wright telephoned to the Aero Club of Sarthe his intention of contesting for the Michelin Cup.

At 9 o'clock, the members for the Commis i s ion of Aviation of the Club, were at Auvours. At 11 minutes past ten Wright took the air, staying there one hour and 54‘.

The course measured for the Michelin Cup is 99 K which distance he made in 1 hour, 53‘, 59“ #.

Wilbur Wright made each turn with the ease of a skilled aviator.

Wright also contested, the evening of the same day for the high prize of the Aero Club of Sarthe. This prize necessitated a height of 100 m being reached. The prize was won in the face of a strong wind and in the glow of a beautiful sunset over the plains: After some preliminary manoeuvres Wright shot 10 meters above the captive balloons which marked the height of 100 m.

Orville Wright in France :— Orville Wright, whose recovery is no more than a question of days, will leave America the second week in January to join his brother in France. He will help his brother to construct and experiment with new machines in all the countries of Europe.

20

2 Henri Farman's Aeroplane :— With the admirable tenacity which characterises him Henri Farman defended to the end his chance for the Michelin Cup.

After having received the visit, at Bouy, of the delegates of the Aeroplane Club of England, Farman executed on the 16th of December some fine flights.

He has now brought the machine back to its primitive form of biplane and supplied it with an aerial Renault motor.

Robart Aeroplane :— An aviator of the first order, M. Henri Robart, is going to commence at Amiens the trials of a monoplane of 50 m 2 supplied with an 8 cylinder 50 H.P. Antoinette motor driving two wooden propellers.

Guyot Aeroplane :— M. Guyot is constructing a biplane having a front control and rear stabilizing tail which will be driven by a 2 cylinder 40 H.P. motor.

Deschamps and Blondeau Aeroplane :— MM. Deschamps and Blondeau, the well known constructors of motor boats have put in the field, in view of the aviation meeting at Monaco, two aeroplanes of different types.

Hornust Plane: — M. Hornust is trying at Saint-Piat, near Maintenon, a plane of 12 meters in length by 3 m 30 in width in the form of a bird with unfolded wings. At the extremity and at the rear of the wings are some small wings governed by wires passing over return pullies which can be controlled by hand.

Santos-Dumont's Aeroplane XX: — This machine which had been taken to Issy for the continuation of the trials, has been brought back to the aerodrome shed of Neuilly-Saint-James 21 3 where Santos-Dumont had some changes made which he judged necessary.

The Trial of the “Zipfel” biplane :— On the 25th of November the Zipfel biplane made four flights of 100 to 300 meters at a height of 3 m.

On the 26th of November, at 9 o'clock in the morning it flew 300 m in 15“ at 6 to 8 m height. Supplied with a 50 H.P. Antoinette motor, the Zipfel biplane, made on the 1st of December, at Lyon, two flights of 800 and 1000 m in a straight line and half circle. On the 9th of December it flew 1500 m. On the 17th of December it flew 500 m. and on the 18th of that month a wing was damaged.

The Grade Triplane :— The inventor Grade has increased the carrying surface of his triplane.

The Flugel Aeroplane :— At Styrum-Mulheim, a machanist, M. Flugel has invented an aeroplane which has been bought by the cosmographic observatory at Breslau, where the construction has already been commenced.

German Bureau for Aeroplanes :— At Berlin, the inventor Rumple has opened a Bureau of Studies for Projects and Ideas on Aviation.

The R. Schnell Monoplane :— At Lindau, the inventor R. Schnell is complet e i ng a monoplane with very large and convex wings and a stabilizing tail. The model of this aeroplane was exhibited at the exhibition at Munich last winter.

Several other machines are being constructed in Germany. All their inventors think they are in possession of the definite “solution”.

22

4 An Aviation Chair :— The superior polytechnic School of Charlottenburg, near Berlin, has been given a chair for the study of Aeronautics and particularly of Aviation.

The Wright Patents in Germany: — It is announced that Wright's German patent has been bought by the Loeve and Cie fabrique d'armes.

The Roë Aeroplane: — M. A.V. Roë, who has, in London, made some very successful experiments in a monoplane with a 24 H.P. Antoinette, has just finished the construction of a triplane of 35 H.P., with warping wings, which he proposes to try in the month of April.

Russia's grant to an Inventor: — Russia's superior War Council allowed 50,000 roubles to M. Tatarinoff for his aeronautical experiments.

The Aeroplanes in the American Marines :— The marine department of the United States has put in a grant for the construction of 4 aeroplanes, the first to be delivered 5 months after the signature of the contract, the three others to be furnished in 8 months. Speed required: 40 miles an hour with an aviator and a passenger on board. The machine must be able to fly 4 hours and carry enough gasoline to cover 200 miles, and be able to rise from the surface of the sea without special launching apparatus.

The Caters Biplan ? e :— On the 30th of November, at Anvers, Baron de Caters flew 200 m at a height of 4 m on his biplane constructed by the Voisin Brothers. It is their classic type of biplane.

23

Aeroplane Antoinette V .

We learn from L'Aerophile that the Antoinette Aeroplane has made at least one successful flight at Issy, France. This is very important news as the machine is entirely different from those machines which have successfully flown thus far. It might almost be said that it is the beginning of a new era in the construction of flying machines. The Antoinette Company are probably the most successful light motor builders in the world and it is this Company which is responsible for the Antoinette V. The following is a description of the machine.

Description of Machine .

After having given to the aviators of France the famous light motor which has enabled them to succeed so well in the progress of aviation, the Antoinette Society has undertaken to put in the field an aeroplane upon very original lines.

After serious preparatory researches and demonstrations of practical flight with the Gastambide-Mengin, the Company finally built the Antoinette V, a monoplane. In this type they have found advantages in the simplicity of form, natural stability, and minimized head resistance in its progression through the air.

The Antoinette V Aeroplane, through the rational conditions in which it has been studied, is worthy of a detailed description.

Wings :— The wings or supporting surfaces which are symmetrical in form and two in number maintain a trapezoidical 24 form throughout. The wings or supporting surfaces are pitched at a slight angle describing a shallow V. They are about 12 m 80 in breadth.

The total surface of each is 25 m 2 their angle of attack about 4°. Their frame consists of many longitudinal and transverse skeleton struts which intersect one another and which are triangular. The surface of each wing or supporting surface is warped so as to prevent a symmetrical curve to the wind of advance.

The framework of the wings or supporting surface weighs but 1 kg to the sq. meter without the cloth. In the construction used for the wings or supporting surfaces based on the principle of the triangle and the pyramid the materials work for tension and compression. This is the same principle as the construction of the metallic trusses of the Eiffel Tower. Its application to the construction of the wings of an aeroplane has enabled it to obtain a rigidity and solidity in conjunction with the greatest possible lightness.

<u>Body:</u> — The body of the Antoinette Aeroplane has the form of a shell with transversal triangular sections (tetrahedral by the way). The whole body insures a fair form. The bow coming to a well shaped point and the stern tapering.

<u>Cloth</u> :— The body and the wings are covered with a many times varnished and pumiced cloth giving them a remarable polish admirable for gliding through the air.

25

<u>Tail:</u> — The posterior extremity of the body carries horizontal and vertical surfaces which form the tail. Furthermore, there is a vertical control in two segments and a horizontal control which are placed one, in prolongation of the horizontal appendage, the other in prolongation of the vertical appendage. The appendages of the tail have considerable efficiency on account of their great distance from the center of gravity. Also by their position at the rear they insure the stability of the machine <u>for there is advantage in placing all resistance at the rear, so that the machine tends to maintain stability</u> .

<u>Small Wings (Wing tips)</u> :— Also to insure transversal stability in gusts of wind, two small wings or wing tips are set at the rear of the supporting surfaces and at their extremity. The

operator by the moving of a lever elevates one and depresses the other. This uniformity produces the same effect as warping but with more energy.

Controls :— The controls, insuring the direction and s a t ability of the aeroplane are under the hands of the operator. One control placed to the right, governing the vertical control, the other placed to the left, governing the small wing-tips, and also the horizontal control. They can be operated together or separately by the same hand. This very ingenious system which allows for all the combinations of movements makes the control an easy feature. Two small handles placed forward serve to regulate the advance of the spark and the flow of gasoline. A pedal clutch allows a motor to run free momentarily and a second clutch, convenient for the hand, allows the operator to completely disconnect the motor.

26

Supporting frames :— The machine is supported on the ground by two crutches under the supporting surfaces, and one under the rear. The shock of impact on landing is greatly lessened by a compressed air device which acts as a spring. These shock absorbers are very simple devices. The uprights are composed of two tubes one telescoping the other, one tube forming the body of the pump the other tube the piston. L'Aerophile tells us that this unique device for absorbing the shock of landing works perfectly. The supporting frames are constructed in such a way as to permit the machine to strike the earth at an angle of 45° without serious consequences.

Motor and Propeller :— The motor installed is an Antoinette 50 H.P. 8 clyinder. It is in the extreme front of the machine just behind the propeller. The propeller is of light metal and is composed of two blades. The motor now installed is of 1908 type. This motor will soon be replaced by one of this year s ' s type.

The 1909 Antoinette Motor :— The new motor develops 55 H.P. and has eight cylinders. In the old Antoinette motors the cylinders and the cylinder head were in two pieces. This former arrangement was supposed to give the greatest possible lightness but it had its disadvantages. In the 1909 model the cylinder and its accompanying valves is forged in a single piece of steel and there is no joint in the internal part where the explosion takes place. After laborious researches the Antoinette Society hit upon a forge which guaranteed to stamp these cylinders.

27

It is only through the perfecting of machinery and the use of sharp tools that the Antoinette Company have been able to forge these cylinders. The cylinders represent a real carving inside and out, made from blocks of steel.

The cylinder is worked all through so as to do away with useless weight. The machine is 700 grams per cylinder lighter than the old model, making more than 5 kgr less weight when the 8 cylinders are taken into consideration. The water tank is red copper obtained by electrolysis.

A word about the radiator. It is composed of tubes with thin partition and great surface for cooling. These tubular radiators are grouped in the form of a panel, following the lines of the body of the machine. The weight of the radiator is about 12 Kgr, surface 12 m 2 . Radiation is made by connecting the motor with a reservoir placed between the cylinders and serving to separate the water from vapor. This constitutes a closed circuit. The circulation of the water can be made by the principle of the motor siphon or by means of an additional pump.

The radiator or rather radio-condensor is put in communication with the top of the reservoir which contains the vapor. This vapor liquifies in the radio-condenser. The condensed water is immediately sent into the reservoir, the result is that the vapor which has a less density than the air can only be lightened. The total quantity of water for cooling carried aside is 12 m. liters . The quantity of water vaporized by the 50 H.P. motor is 1 liter per minute. The quantity of vapor carried in the radiator is only a few cubic decimeters, its weight therefore is quite unimportant. 28 As for the water which is in circulation in the machine it weighs less than a half liter. It may be seen then that with the Antoinette radiator the water nece ? s ary for cooling is composed simply of the water which is in the motor.

Propellers :— The propeller placed in advance of the machine is an Antoinette of two blades being of very light and very strong construction. A steel pipe is run from tip to tip of the propeller and on this the two blades are made fast. The propeller is run direct, the engine turns over 1100 revolutions; diameter of the propeller is 2 m 20. The total carrying surface of the machine is 50 m 2 . The length between perpendiculars 11 m 50 with a width of 12 m 80.

The Aviator's Position :— The flights thus far have been made by M. Welferinger of the Antoinette establishment who came into prominence in connection with the Gastamabide-Mengin machine. The best precautions have been taken for the convenience and security of the aviator. The seat has been constructed with much care back of the wing at quite a distance from the propeller and the motor. It is placed well inside the body of the machine. In case of accident everything would be broken before the aviator was reached.

G.H.B.

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXX Issued MONDAY, FEB. 1, 1909

ASSOCIATION'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell Assistant Editor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO.XXX ISSUED MONDAY FEB. 1, 1909.

Beinn Bhreagh, Near Baddeck, Nova Scotia .

TABLE OF CONTENTS .

ILLUSTRATIONS.

McCurdy's Water-Spout .

Jan. 27, 1909 :—Attention is called to the interesting water-spout phenomenon described in this Bulletin by Mr. McCurdy. It demonstrates the presence of a partial vacuum underneath a rotating propeller. It suggests the feasibility of increasing the lift of a flying machine by placing a surface impermeable to air below our propeller at places where it is known that a partial vacuum exists.

This recalls to my mind experiments made in Beinn Bhreagh Laboratory some years ago in testing the lift of aeroplanes set at different angles upon a whirling-frame. The whirling-frame was suspended from one arm of a beam and balanced by weights carried by a scale pan on the other arm. The rotation of the whirling-frame was caused by small electric fan-propellers which were set upon the whirling-frame, the electric current being led to them from a dynamo through a frictional contact at the rotary point of suspension.

When the whirling-frame, fitted with aeroplanes tilted up at a specific angle, was caused to rotate by the action of the fan-propellers, it went up and weights had to be removed from the scale pan at the other end of the beam in order to restore the balance. The amount of weight thus removed was taken as a measure of the lift of the aeroplanes when traveling through the air at the observed speed. Hundreds and even thousands of experiments were made with this whirling-frame and the results are preserved among the Laboratory records. Though made many years ago they have never been published and I think it would be of value to the members 2 2 of the A.E.A. to have some detailed account of them in the Bulletins. The records are so voluminous, however, that it will take considerable time to prepare a resumé of them for the Association.

In making these experiments it was important that no part of the lift accredited to the aeroplanes should have been caused by the propellers themselves, for if the propellers were not arranged to push horizontally their thrust would yield a lift plus if pushing upwards, minus if pushing downwards. It was therefore my custom, before attaching the aeroplanes to the whirling-frame, to start the motors so as to be sure that the operation of the motors themselves did not disturb the balance when the frame rotated without aeroplanes.

I then made the discovery that, when the motors were pushing perfectly horizontally, the presence of a horizontal strip of tin underneath the propeller produced a lift.

I attributed this, at the time, to the action of the propeller in shovelling off the air from the upper side of the tin surface, leaving atmospheric pressure practically undisturbed below.

I found the lifting effect much improved by bending the strip of tin into a semi-circle surrounding the lower half of the propeller.

I made many experiments to ascertain the most efficient form of surface to be placed beneath the propeller; and these resulted in a model which has been preserved in the Laboratory Museum, and which should be hunted up. 3 3 The records of the experiments also should be examined to ascertain the quantitative effects produced.

The propellers employed were the ordinary brass fans used for cooling rooms. It is obvious that with such propellers as we use in our aerodrome experiments very much more powerful effects should be produced. McCurdy's observation that the water under the propeller of the “Loon” rose to a height of from 12 to 18 inches above the general surface, when the edge of the propeller was at a distance of 3 feet from the water level, indicates a very powerful action.

Suppose the vacuum caused by the rotation of the propeller to be sufficient to sustain a column of water one foot high, this would indicate that a surface impermeable to air, placed two or three feet below the lowest edge of the propeller, would experience an unbalanced upward pressure of about ½ lb. per square inch, or 72 lbs. per square foot.

This is a very considerable pressure; and if it could be utilized in the support of the machine, it would save an enormous extent of supporting surface.

A strip of metal or wood, bent into an arc of a c r i rcle, and fitted underneath the propeller, would not only serve as a guard to the propeller, but would probably yield a very considerable lift.

Suppose its surface to be resolved into an equivalent horizontal surface equal to 6 square feet (6ft. long 1 ft. wide) this would yield a lift of 432 lbs. upon the assumption of ½ lb. per square inch.

4

4 I would suggest lo k o king into this matter experimentally; for, should it turn out to be the case that we are neglecting to utilize a considerable lift by not placing a surface underneath our propeller, a new and useful invention will result of a distinctly patentable kind, that would necessarily be employed in every future flying-machine having a rotatory propeller. A.G.B.

5

ARRIVAL OF THE “SILVER-DART” .

Jan. 28, 1909 :— Seven cases containing portions of the “Silver-Dart” are now at Beinn Bhreagh Laboratory; and two o ? t her cases have arrived at Iona where they are held awaiting the settlement of a charge for $425.00 for the special car in which t e h ey came. See report relating to the shipment of the “Silver-Dart in this Bulletin by the Secretary. The engine for the “Silver-Dart” is now on its way from Hammondsport but has not reached here yet. A.G.B.

SELFRIDGE .

Jan. 28, 1909 :— The committee of the Aero Club of America having in charge the erection of a monument to Selfridge, finding that a monument would not be permitted at the spot where the disaster happened as it would interfere with the movements of the troops on the parade ground, have been corresponding with Mr. E.A. Selfridge concerning the erection of a monument at the grave.

Mr. Selfridge desires that the monument there should be erected exclusively by the family; but suggests that a bronze tablet might be placed by the Aero Club on the monument he is erecting. It is probable that this proposition will be acted upon favorably by the Committee.

Mr. Chanute has returned the manuscript of Lieut. Selfridge's paper concerning Progress in the Art of Aviation which forms the subject of our Bulletin No.II. He expresses high appreciation of the paper. He thinks it well worthy of 6 publication; and believes that it will reflect honor upon Lieut. Selfridge. He very kindly offers to aid us in obtaining photographs to illustrate the proposed memorial volume to Selfridge.

The Secretary has received biographical notes concerning Lieut. Selfridge from his father Mr. E.A. Selfridge; and Maj. Squier has promised biographical material relating to Selfridge's life in the Army. The Secretary will now get the work ready for publication. A.G.B.

Medals for the Wright Bros .

Jan. 28, 1909 :—When the Wright Bros. return from Europe they will find America prepared to do them honor for the great work they have accomplished in promoting the art of Aviation.

The medal of the Aero Club of America will be presen s t ed to them by the President of the United States.

The Smithsonian Institution will award them a medal.

Senator Foraker has introduced a resolution in Congress authorizing the Secretary of War to give gold medals to each of the Wrights. The resolution has been adopted by the Senate of the United States without debate; and the newspapers have announced that

"Gold medals are to be awarded to Orville and Wilbur Wright by Congress in recognition of their services in the advancement of aerial navigation, if the House of Representatives approves a resolution by the Senate to-day, (Jan. 25). A.G.B.

7

LETTERS FROM MEMBERS.

Curtiss to McCurdy.

To J.A.D. McCurdy, Baddeck, N.S.

Hammondsport, N.Y., Jan. 7, 1909 :— The machine got held up in Bath by being too big for the express car. It was forwarded on to Niagara Falls by freight, and will go from there by express if it will go in the car, otherwise, freight. We are getting ready to work out the 8 cylinder and will give it a brake test before shipping.

Since you left I had a wire from Mr. Bell to come at once, but we must have our Directors' meeting so as to make a report to the State before the 15th and, therefore, would have to be back by the 14th, and wired that I could come if necessary but would have to come back by that time. Since reading the last Bulletin, I am sure it would be wise to make a brake test of the engine before shipping it.

(Signed) G.H. Curtiss.

8

Curtiss to Bell .

To A.G. Bell, Baddeck, N.S.

Hammondsport, N.Y., Jan. 15, 1909 :— I have your message and have wired as follows:

"Message received. Am securing transmission and getting engine ready to come without delay".

I have a letter from McCurdy, probably written before he received mine, also a message from Baldwin about the transmission for No. 5. I am getting everything ready to forward by express, and I shall come as soon as the engine is tested. We have put new jackets on to replace the ones which had burst in freezing, also made new connections for the water pipes to avoid further trouble. The brake test will be made in a day or two, and I shall then be free to come to Baddeck, the engine following at once by express.

I appreciate the importance of the patent matters, but I am sure it is also important to get the power plant of tetrahedral aerodrome No. 5 ready to ship so that there will not be any delay when we are ready to take her out on the ice.

Our stockholders' meeting was postponed until to-morrow (Satur ad da y) when we shall elect directors to fill the vacancies, and this matter will be off our hands.

I enclose a picture of a four belt transmission from France which has a striking resemblance to ours.

We are building the sprockets and chains to be used on the No. 5.

(Signed) G.H. Curtiss.

9

Curtiss to McCurdy .

To J.A.D. McCurdy, Baddeck, N.S.

Hammondsport, N.Y., Jan. 15, 1909 :— I was more than pleased to get your letter of the 11th. It is the first word I have had, except Baldwin's message, in regard to what is wanted and to use Mr. Bell's expression, "I was powerless to act" in making the transmission. Baldwin's message calls for:

20 ft. of countershaft, hollow preferred.

1 doz. roller bearings.

½ doz. thrust bearings.

I think we had better ship a length of 1 #–11 galvanized tubing with some Hess-Brights to fit. These are combined radial and thrust bearings. The largest bearing we make is for 1 inch shaft only.***

In regard to the transmission will say that the chain we ordered has come; it weighs 1 ½ lbs. to the foot. It will make a very heavy transmission, but it will hold.

I just mailed a picture of a four belt transmission from abroad. It is near enough like ours to be a twin, We have put new jackets on the engine with a new style coupling, and are working night and day to get it ready to test and ship. We have also fitted a flange on both ends of the shaft as per Baldwin's message; I don't know what this is for, however.

(Signed) G.H. Curtiss.

10

Curtiss to Bell .

To A. H G . Bell, Baddeck, N.S.

Hammondsport, N.Y., Jan. 18, 1909 :— Our long delayed stockholders' meeting has been held and all matters demanding attention settled. The big eight cylinder is being set up to test. As I wrote you, we fitted new jackets in place of the ones which had burst by freezing. On the new ones we have made an improved fitting for the water-connection which took a little time; we also had some delay caused by a bad casting for the pony brake outfit which is being made water-cooled to withstand the heat of long continued tests.

In regard to the test, I am pleased to report that our Mr. Pfitzner has secured from Germany a manograph which will be used on the motor to determine the mean effective pressure and action with and without the ports, and various other data of value in construction of engines for flying-machines. I am told there are but two or three instruments of this kind in America. The records are made by the use of a sensitive film and a reflected light. Charts will be sent with our report.

We have made every arrangement to leave as soon as we are through trying the engine, leaving that to come on by express. Mrs. Curtiss will come with me for a short stay.

Just had a letter from Baldwin in regard to shafting, transmission etc. I think we will have accumulated everything needed for this work by the time the engine arrives. I expect we will be on the road by the time this letter reaches you. We are thinking of going via Montreal. (Signed) G.H. Curtiss

11

BEINN BHREAGH EXPERIMENTS: Reported by the Editor.

Preliminary Experiments relating to the apparatus to test the lift and drift of Drome No. 5 on the ice .

Jan. 6, 1909 :— Experiments were made to-day in a very high wind with a quarter sized model of Drome No. 5 to test whether a kite could be flown by two or more very short cords only about one or two meters long as proposed for measuring lift and drift and angle of incidence on the ice. The experiments were made in the kite field. Wind-velocity:— minimum over 26, maximum over 28 miles per hour.

The kite flew very well by short lines and even when held by hand without any lines at all. When held by hand and the angle of incidence gradually changed gradations of lift were perfectly manifest to the sense of touch.

As a general result we came to the conclusion that it is practicable to obtain measurements of lift and drift and angle of incidence upon the ice with the kite attached to a moveable cradle something like the arms of the “Ugly Duckling” without flying the kite at all, so that there would be no danger to the kite of thrashing about in the wind. It can be attached firmly to the moveable cradle, and the pull in various directions measured by spring balances. A.G.B.

12

Drome No . 6

Jan. 16, 1909 :— A copy of the Oionos Kite shown in Bulletin XX, pp.33–34 has been made crudely of sticks or slats having a cross-section of about 10 mm by 5 mm tacked together at the junctions and tied. No special care had been taken, as in the case of kite shown in Bulletin XX p.33 to reduce the head resistance excepting that the sticks were enclosed in the cloth covering, which was composed of ordinary cotton sheeting. The kite was tried this afternoon and a series of observations were made to determine the lift, drift and efficiency.

Dimensions :— Length from fore to aft 1 meter (top plane); width from side to side 7 meters (top plane); depth (oblique) 1 meter.

Body 415 cm long. Triangular in cross-section; oblique section at the middle point forms an equilateral triangle of 50 cm side body tapers to a point at either end. The body was pushed through the lower center cell of the kite as far as it would go and then fastened in place. It projected further behind than in front. The length from the middle of the kite to the extreme rear was 252 cm and the head was 163 cm in front of the middle of the kite.

Upon the body at the rear was fitted a flat tail inclined upwards at the rear so as to make an angle of 10° with the horizontal planes of the kite. The front edge of this tail was 147 cm behind the center of the kite. The rear edge of the tail was wider than the front edge; front 102 cm; rear 126 cm; oblique side edges 76.5 cm; distance from front to rear of tail measured along a line vertical to both edges was 75 cm.

As body protruded further at the rear than at the front and carried a tail, a weight of lead was attached to the bow to restore the balance of the kite and to make it slightly head-heavy.

13 137639-A

209 taken 1909 Jun 16?

138243-A 14

2 Weight :— The head load of lead weighed 1986 gms. The total weight of kite (including lead) was 37 lbs, or 16798 gms.

Surface .— The horizontal surfaces amounted to 10.2500 sq. m, and the oblique surfaces to 11.9075 sq. m.

This refers to the wing piece alone and does not include the surface of the tail or body. The surface of the tail be ignored as not constituting any portion of the supporting surface of the kite; for, on account of its being inclined upwards at the rear, the air-pressure was always upon its upper surface.

We should however include in the supporting surface the V shaped bottom of the body. This is estimated at about 2 sq. m oblique.

It is difficult to estimate the total amount of surface as some of the surfaces were horizontal and others oblique, and it becomes necessary to reduce all to their horizontal equivalents or all to their oblique equivalents so as to get the total in one or the other kind of surface.

In making the calculation I have estimated the area of the horizontal projection of the oblique surfaces and taken this as the horizontal equivalent of the oblique surfaces.

In a similar manner I have considered the horizontal surfaces as the horizontal projection of a certain amount of oblique surface and considered this as the oblique equivalent of the horizontal surface. The following forms the basis of the calculation.

1 sq. m oblique = .5774 sq. m hor.

1 sq. m horizontal = 1.7320 sq. m obl.

With this as a basis I find the total surface as in the following table:—

Horizontal sq. m Oblique sq. m Horizontal surfaces 10.2500 actual 17.7530 estimated Oblique surfaces 6.8750 estimated 11.9075 actual Bottom of Body 1.1548 estimated 2.0000 actual Total supporting surface 18.2798 esti. 31.6605 esti. 15

3 Flying weight :— Weight 16798 gms. Surface 31.6605 sq. m oblique. Ratio 530 gms. per sq. m oblique. Weight 16798 gms. Surface 18.2798 sq. m horizontal. Ratio 918 gms. per sq. m horizontal.

There was quite a heavy wind this morning (Jan. 16) from the northeast; in fact a storm wind which died down considerably in the afternoon when the experiments were made. The Oionos Kite was flown by means of a quarter inch Manilla rope 100 m long weighing 10 lbs, attached at a point 86 cm in front of the center of the kite. Five series of observations of wind velocity, altitude, and pull were then made with the following results:—

Exp. 1. Wind 11.25 mph. Alt. Pull 40 20 38 10 33 25 32 30 30 40 31 10 31 20 33 70 41 10 36 20 10 Obs. 345 255 Aver. 34°.5 25.5 lbs Exp. 2 Wind 12.40 mph. Alt. Pull 32 10 35 40 35 20 32 30 38 50 29 40 30 35 30 50 30 40 28 20 10 Obs. 319 335 Aver. 31°.9 33.5 lbs.

Exp. 3 Wind 11.20 mph. Alt. Pull 27 30 26 10 25 30 17 20 35 30 40 50 33 55 30 30 30 30 30 35 10 Obs 293 320 Aver 29°.3 32.0 lbs Exp. 4 Wind 10.50 mph. Alt. PULL 28 10 24 23 28 20 27 10 20 5 20 10 21 10 20 5 20 20 22 10 10 Obs. 230 123 Aver. 23°.0 12.3 lbs. 16 4 Exp. 5 Wind 9.08 mph. Alt Pull 21 20 25 30 26 30 26 20 27 20 26 20 26 20 27 15 25 10 22 10 10 Obs 251 195 Aver 25°.1 19.5 lbs.

Summary

Obs Alt Pull Obs Wind Exp. 1 10 345 255 1 11.25 Exp. 2 10 319 335 1 12.40 Exp. 3 10 293 320 1 11.20 Exp. 4 10 230 123 1 10.50 Exp. 5 10 251 195 1 9.08 50 1438 1228 5 54.43 Aver 28°.76 24.56 lbs 10.886 mph

Remarks :— The kite flew very steadily in spite of considerable fluctuations in the force of the wind as indicated by the fluctuations in the pull. During experiment 4 when the wind diminished the kite began to turn on one side coming slowly down but recovered itself. On one occasion the wing piece seemed to actually touch the ground at one end, the other end being almost vertically in the air. The kite recovered itself however without any damage and the five series of observations were successfully concluded.

Efficiency :—The average angle of altitude was 28°.76 which I have taken as 28° 45‘. The following are the sine and cosine of this angle:—

17 138244-A

C210 taken 1909 June 16

18

sin = .48099 say .481

cos = .87673 say .877

The average pull was 24.6 lbs at the above angle from which I calculate,

Vert. pull = 11.8326 lbs, say 11.8 lbs.

Hor. pull = 21.5742 lbs, say 21.6 lbs.

The lift is equivalent to the load sustained in the air plus the vertical pull. The drift is equivalent to the horizontal pull.

Lift.

Weight of kite 37 lbs

Weight of rope 10 lbs

Vertical pull 11.8 lbs

Drift

Horizontal pull 21.6 lbs

Efficiency =lift/drift =58.8/21.6 = 2.7

At the conclusion of Exp. 5 the kite was taken down and the flying-line attached to a point 50 cm in advance of the cetner of the kite. The following experiment was then made:—

Exp. 6 Wind 9.00 mph. Alt Pull 36° 70 lbs 45° 50 lbs 60°+ 10 lbs 60°+ 30 lbs

Remarks :— After the last observation noted the front part of the kite caved in while flying and the kite gradually turned over sideways and landed upside down. This was due to the way in which the flying-line had been attached. It was not fastened around the body but to a cord running from the middle of the kite at the bottom to the nose and supported where the strain came by guy wires to the front 19 edge of the top aeroplane. This brought the cell sticks of the front of the kite under compressional strain and these not being reinforced by beading gave way. The kite at the time was flying at a great altitude quite above the limit of measurement of the inclinometer employed which could not register a greater angle than 60°. A.G.B.

20

WATER-SPOUT CAUSED BY ROTATING PROPELLER: By J.A.D. McCurdy.

Jan. 16, 1909 :— During one of the experiments with the "Loon" at Hammondsport at curious phenomenon manifested itself while tuning up the engine at the head of Lake Keuka. The "Loon" had been placed in the water between the dock and held there by four men while the propeller was rotated rapidly by the engine; the idea being to have the engine in the best possible running order before letting the "Loon" go. No sooner had the propeller begun to rotate when it was noticed by those present including Mr. Curtiss and myself that a small water-spout was formed substantially directly under the plane of rotation of the propeller. It may have been a little bit behind this plane and my impression is that such was the case, although I could not say so definitely. This water-spout in the shape of a pyramid rose to a height varying between 10 and 18 inches, rising and falling between these limits according as the speed of the engine was accelerated or retarded. J.A.D. McC.

21

PROPOSED ICE-BOAT FOR MEASURING EFFICIENCIES OF PROPELLERS: By J.A.D. McCurdy.

Jan. 16, 1909 :— There have been many experiments made to test the efficiencies of propellers by those interested in the subject, but in almost all cases these tests have been performed under conditions which differ from those in the case of the flying-machine, or in other words when the propeller is free to advance along the line of its thrust. Maxim performed a series of tests with propellers moving along the line of their thrust by their reaction on the air taking advantage of his small railway over which his flying-machine was run in its preliminary trials. He announced to the world that the push of his propeller was substantially the same when advancing as when restricted to rotate in its original plane. These results however are not accepted absolutely by the Aeronautical world. It took us about two weeks to arrive, in an experimental way, at the proper design of propellers to be used on the "June Bug" and we also spent considerable time in trying to arrive at the proper form of propeller to be used in the “Silver-Dart”, a machine of greater flying weight and with a more powerful engine.

If we determine the value of the two elements necessary for a propeller to drive a certain machine namely, push and theoretical pitch speed, we would know at once the diameter of propeller required and the pitch angle and the combination of these elements would determine for us the most economical H.P. with which to drive this propeller, hence we would immediately know the engine required.

22

2 It seems as though a very good way to obtain these data would be to mount engine and propeller on an ice-boat. The counter-shaft for propeller could be arranged to come in contact with a spiral spring so that the thrust of the propeller would compress the spring and being proportional to the amount of compression the thrust for different speeds of rotation or for different diameters of propellers could be readily observed by a pointer so arranged as to read directly in pounds on a graduated scale.

A propeller test would be gone through in this manner. The engine having already been subjected to a brake test, the horse-power of the engine would be determined absolutely for speeds of rotation var in yi ng by 50 revolutions from say 400 to 1200 revolutions per minute. The ice-boat first being held so as not to be allowed to advance, the propeller would be revolved at say the lowest number of revolutions consistent with the brake horse-power readings of the engine. In such a case we would have a hundred per cent slip. The thrust would be read directly off the graduated scale and the revolutions being known we would know the following:— Mass of air displaced by propeller and the velocity with which the unit mass (amount displaced at each rotation) would be displaced, or in other words the MV of air displaced by the propeller. We would also know the horse-power of engine necessary to produce this MV of the air. Readings would be taken varying the speed by 50 rotations. The ice-boat would now be let go and in virtue of the push of propeller would advance over the ice along the line of 23 3 thrust of propeller. As before the rotations of the propeller would be taken and the push observed for these rotations and the speed of advance of the ice-boat relatively to the air determined. In this case we would have conditions similar to those of a flying-machine. From thesedata we can determine exactly what our propeller can be relied upon to do in a flying-machine. It is a question whether the push will be the same, greater or less as recorded in the case with similar speed of rotation when the ice-boat was prevented from advancing. We can use here propellers in which the variable points are diameter and pitch and the best combination of these two elements consistent with the horse-power they would require can be determined to suit the case of a flying-machine of certain mass and head resistance to be driven at a certain speed.

It seems as ??though such a series of experiments would be invaluable to those interested in Aeronautical work and would save considerable work and expense in that the cut and try method would be almost eliminated.

J.A.D. McC.

24

REPORT CONCERNING SHIPMENT OF THE “SILVER-DART”: By J.A.D. McCurdy, Secretary of the A.E.A.

Beinn Bhreagh, Jan. 28, 1909 :— On Jan. 15, 1909 the following bill was received from A.S. MacDonald, Secretary of the Victoria Steamship Co. Ltd.

Baddeck, C.B., Jan. 15, 1909.

Mr. J.A.D. McCurdy, Treas. Aerial Association.

4 boxes and crates (in bond) $93.45

The following letter was also enclosed:—

Baddeck, C.B., Jan. 15, 1909.

J.A.D. McCurdy, Esq., Beinn Bhreagh. Dear Sir:—

You will please find enclosed freight and express charges on cases from the U.S. Kindly send me a cheque for the amount as the Station Master wants the funds.

Yours truly, (Signed) A.S. MacDonald, Sec'y, Vic. S.S. Co.

The shipment we received at Baddeck consisted of seven pieces which were immediately taken over to Beinn Bhreagh Laboratory.

It seemed as though the crate containing the wings was stalled somewhere either at the border, or at Montreal and so on January 16 the following telegram was sent to Mr. Curtiss:—

McCurdy to Curtiss .

Baddeck, Jan. 16, 1909 :— Mrs. Bell here till February. Bring Mrs. Curtiss sure. Large crate “Silver-Dart” stalled either at border or at Montreal. Locate en route. Don't forget flywheel.

(Signed) J.A.D. McCurdy.

25

2 On January 20 I was notified over the telephone by Capt. Dan MacRae of the Blue Hill that the rest of the flying machine boxes or crates had arrived at Iona. This part of the shipment consisting of two pieces had come from Suspension Bridge to Iona in a special express car attached to the regular mail train. For this shipment the Company had an extra charge against us of $425.00 being the regular rate charged for a special express car from Suspension Bridge to Iona. As this seemed to him to be a large amount for expressage, he thought it better to get orders from us (the consignee) before taking shipment out of

the hands of the Express Co. and bringing it over to Baddeck as was the usual custom. I told him that there must be some mistake somewhere and to leave shipment in charge of the Company until we could arrange the price satisfactorily. I therefore sent the following telegram:—

McCurdy to Curtiss .

Baddeck, N.S., Jan. 20, 1909 : : — Large crate arrived Iona to-day. Expressage special car $425.00. Can you locate mistake from that end? If so have Express Co. wire Agent Iona to deliver at regular rate.

(Signed) J.A.D. McCurdy.

The following is the reply received:—

Curtiss to McCurdy .

Hammondsport, N.Y., Jan. 23, 1909: — Do not accept shipment till charges are corrected. Doing everything possible, entirely their mistake. Intended leaving to-day but will wait till Monday. Will wire you again. Eight cylinder testing satisfactory.

(Signed) G.H. Curtiss.

26

3 I had McKay telephone Mr. MacDonald, Express Agent at Iona to forward us bill of charges for the two shipments so that we might have it in black and white.

The following bill was received in a McKay and MacAskill & Co. envelope, it having been addressed to us by McKay who received it from Dave Dunlap, the mail-man who in turn received it from McDonald at Iona.

Canadian Express Co., Iona Station, Jan. 19, 1909.

Prof. A.G. Bell, To Canadian Express Co. Dr.

For transportation of freight from Hammondsport, N.Y.

2 racks in Express Special Car $425.00

This bill was made out on blank form of the Inter-Colonial Railway.

On January 26, I went over to town for the purpose of telephoning MacDonald from McKay's store. I wanted to find out what he had done in the matter and in fact how things stood in reference to the Company. He informed me that he had received a telegram from the Canadian Express Company's Manager, Montreal, in reference to our consignment of goods, and that he had sent this telegram to me by the afore mentioned, Dave Dunlap. A few minutes after my talk with him I met Mr. Dunlap in J.P. McLeod's store and he handed me the following telegram:—

J. Price to Agent Iona .

Montreal, Jan. 25, 1909 :— Graham Bell should pay car load rate Suspension Bridge to Iona, account special car used all the way through, boxes being too large for regular car. What charges will he pay on account and take delivery and we will submit question of charges to Railway Commission, Bell to agree to pay what 27 4 amount they decide as right. Answer quickly.

(Signed) J. Price.

Mr. MacDonald had suggested that we not only write him that we decided to do in the matter, but telegraph our answer direct to Mr. Price. Accordingly, as soon as I returned to Beinn Bhreagh and consulted with Mr. Bell, the following telegram was sent:—

Bell to Price .

Baddeck, N.S., Jan. 26, 1909 :— Have seen your telegram Jan. 25 to Agent Iona, and will say that while we are prepared to pay regu a l ar rate on consignment of goods we will not pay for special car which was unauthorized and we will not refer matter to Railway Commission.

(Signed) Alexander Graham Bell Chairman Aerial Experiment Association.

The following letter was also forwarded to Mr. MacDonald at Iona:—

McCurdy to MacDonald .

Beinn Bhreagh, Jan. 26, 1909 :— I am in receipt of your telegram from Price, Montreal, and after consultation with Mr. Bell and other members of the Aerial Experiment Association, will say that we will pay the regular rate on consignment of goods (flying machine material) from Hammondsport, N.Y. to Iona, N.S., and will not under any condition pay charge of special car which was unauthorized. We will not submit the matter before Railway Commission as suggested in the telegram.

I hope that the whole business will be settled satisfactorily to all parties in as short a time as possible.

(Signed) J.A.D. McCurdy Sec. Aerial Exp. Assoc.

Lat t er in the day the following telegram was received:—

28

Curtiss to Mc Curdy .

Hammondsport, N.Y., Jan. 25, 1909 :— Large box and all billed together from Suspension Bridge direct to destination as merchandise. Regular rate. Charges added your end. Investigate there at once before Agents report. Mrs. Curtiss and I leaving to-day.

(Signed) G.H. Curtiss.

On Jan. 27 the following letter and bill were received:—

Dunlap to McCurdy .

Baddeck, C.B., Jan. 27, 1909 :— I enclose you memo of charges on flying machine. I was in the car at Iona to-day and the crate on the wings is broken. They will have to be taken out one by one as the crate is of no use now. When you get ready to move them, and you want me to do it, would like to have you go over yourself.

(Signed) D. Dunlap. (Bill enclosed - a postal card notice).

MacDonald to Bell .

To Dr. Alexander Graham Bell, Baddeck, N.S. Iona, N.S., Jan. 15, 1909. Sir:—

I have this day received per express to your address 4 box — * 5 crates which remain entirely at the risk of the owner and will be delivered on payment of the following charges:—

Charges advanced $6.77

Express freight 80.14

Cash paid customs duty

Warehouse

Broker's Commission for entry

Collection

Total $86.91

* 2 crates to follow. Could not get into car at Suspension Bridge. Too large for ordinary car.

(Signed) M.A.J. MacDonald Agt. Forwarded to Baddeck per S.S. Blue Hill.

29

6 All this correspondence concerning the shipment of the "Silver-Dart" from Hammondsport, N.Y., to Iona, N.S., I respectfully submit.

(Signed) J.A.D. McCurdy,

Sec. of Aerial Exp. Association.

McCURDY'S REPORT (CONTINUED).

Beinn Bhreagh, Jan. 28, 1909 :— Since submitting the above report it was decided this afternoon at the regular daily Conference of the Association held at Headquarters, to make out a cheque, payable to the Canadian Express Co. for the amount of regular express charges for the 4 boxes and 5 crates as per their bill recorded in the above report under the date of Jan. 15, for $86.91.

This cheque was made out and forwarded to Mr. A.J. MacDonald, Express Agent at Iona, with the following letter. The request was made that he sign the receipt enclosed and return to us. The form of the receipt also follows:—

Jan. 28, 1909. Mr. A.J. MacDonald, Agt. Canadian Exp. Co. Iona, N.S. Dear Mr. MacDonald:—

I am enclosing cheque for eighty-six dollars and ninety-one cents, being amount due the Canadian Express Co. for expressage on consignment of flying machine material, as per your bill of charges of Jan. 15, 1909. Please sign enclosed receipt and return same to me here,

(Signed) J.A. Douglas McCurdy, Treas Aerial Exp. Association

30

Jan. 28, 1909. $86.91

Received from the Aerial Experiment Association the sum of eighty-six dollars and ninety-one cents being amount in g f ull due the Canadian Express Company for consignment of merchandise consisting of four boxes and five crates containing material relating to flying machine, in which Dr. Alexander Graham Bell is named as consignee.

Signed Agent for the Canadian Express Co.

We are now awaiting to see what the express agent will do in the matter.

(Signed) J.A.D. McCurdy, Sec. A.E.A.

31

THE OUTLOOK ON AVIATION: By The Asst. Editor.

The Wright Brothers have a new steering device. The patent papers describing the patent say:— “In a machanism of the character described, the combination, with a plurality of supports, and a rudder comprising upper and lower planes pivotally mounted on said supports, of a bracket carried by each of said supports, a shaft journalled in said brackets, a plurality of levers rigidly secured to said shaft extending transversely of said planes, links connecting the adjacent ends of said levers to the front and rear edges, respectively, of said upper and lower planes, and means for actuating said shaft.

With a rudder having forward and rearward portions normally in a single plane, of means for positively moving both the front and rear portions of said rudder at different angular velocities with reference to the pivotal center of said rudder, to present the rear portion at a greater angle of incidence than the forward portion.

With a rudder having its front and rear edges normally in substantially the same plane with the body portion thereof, of means for positively actuating both the front and rear edges of said rudder to adjust the rudder at an angle to its normal position and to flex said rudder".

Cortlandt Field Bishop, President of the Aero Club of America, has presented $1000 to the Club which will constitute a fund to be divided into four prizes of a sum of $250 each to be called "The President's Aviation Fund". They are 32 2 to be awarded in 1909 to the pilots of the first four aeroplanes which will accomplish for the first time continuous flight of 1 kilometer or more without touching the earth. In addition to the cash prize the winner will receive a medal from the Aero Club of America.

An Aeronautics Congress was summoned some time ago by the French Government and will meet soon again in Paris. There has also been held an International Conference in London discussing questions bearing upon the future of the art, science, and business of flying. Laws for governing right-of-way for aerial machines are really a serious consideration. In a few years they will be a positive necessity.

Certain French experts in International Law have suggested that a "zone of isolation" be established, above which traffic shall be free, while below the zone, air craft shall comply with fixed rules and signals for right-of-way, place of descent, and so on, and public craft shall obtain the diplomatic consent of the local State.

Forty delegates representing all the important countries of the world met in London, January 11, making the first International Aerial Congress. The purpose of this Congress was to establish rules for navigating the air.

Considerable progress has been made in the plans of the committee in charge of the Hudson-Fulton Celebration which is to be held next September and the Aero Club and the Aeronautic Society have appointed committees which are working with the celebration committee. Assurances have come from Brigadier General Allen that the Government will exhibit the 33 3 results of its aerial experiments, at this exhibition. It is expected that appropriations will be made by Congress so that the Signal Corps of the Army will be able to build airships which may manoeuvre in conjunction with the Atlantic Fleet. The celebration will be held to commemorate Robert Fulton's revolution in steam navigation, and will be augmented by demonstrations of American progress in Aerial Navigation.

Orville Wright said:— “The report that we are forming a syndicate in this country is not true. While we have had several propositions we have not seriously considered any of them.

It has been suggested that a Congress o? Aviation be incorporated at Annapolis.

The Aero Club of St. Louis is arranging to hold an International Indoor Aeronautic Exhibition probably the last week in May. Aeronauts from all over the world will be invited to exhibit. Prizes are to be offered and contests for flying models are being planned.

Monte Carlo has fixed a race for aeroplanes that is to take place in about three months time. In this race competitors will fly from Monte Carlo round a buoy and back to Monte Carlo for a prize of 100,000 francs.

An Aero Club is being formed in Washington. The objects of the Club are as follows:—

“To foster interest in the principles and developments of Aeronautics.

To arrange for lectures and demonstrations.

34

4 To extend honors and hospitalities to eminent aeronauts.

To encourage and arrange for national and international competitions, conventions, congresses and exhibitions.

To co-ordinate the interests, efforts and achievements of the various governmental and civilian investigators in the field of aeronautics in the city of Washington.

To raise funds for the encouragement of aeronautics and to be the custodian thereof.

To offer such medals, trophies and prizes as may be from time to time deemed expedient.

To arrange for trial grounds for demonstrations and experiments.

To encourage the independent foundation of a laboratory of aerostatics and aerodynamics in the city of Washington.

To make collections and keep records".

P.E. Newman, of San Antonio, Texas, has offered to build for the Government an aeroplane to be completed in 60 days. If the machine comes up to the requirements the Government is to pay all expenses and a bonus of $25,000.

On Tuesday, December 24, the President of the French Republic opened the second half of the annual automobile salon at the Grand Palace, and incidentally inaugurated the first real exhibition of practical flying-machines that has ever been held in any country. Among other machines exhibited was the Breguet helicopter aeroplane. The supporting surfaces of this machine are inclined at a great angle, 15 or 20° or perhaps greater. The propellers which are four-bladed, two in number, are also tilted up at an angle which gives both forward thrust and lift. Single-surface machines seem to have had a distinct superiority in numbers over the double triple 35 5 surface of the aeronautical salon this year.

Perhaps the following table of machines exhibited at the aeronautical salon may be of value for reference purposes.

Details Machine Exhibitor spread surf weight engine MONOPLANES m. sq. m. kgs. h.p. Ader's Avion (No.3) Arts et Metiers Museum 16 56 258 40 steam R.E.P. (No.2 bis) Etab. R.E. Pelterie 9.6 15.7 360 35 7-cyl. R.E.P. Bleriot (No.9) Soc. Bleriot 9 24 410 50 16-cyl. Antoinette Bleriot (No.11) Soc. Bleriot 7 13 160 35 7-cyl. R.E.P. Antoinette Soc. Antoinette 12 40 500 50 8-cyl. Antoinette La Demoiselle Santos Dumont 9 67 2-cyl. Pischoff Pischoff and Koechlin 23 17 2-cyl. Vendome (No.2) R. Vendome 9 26 305 50 3-cyl. Anzani Clement-Bayard Clement-Bayard 12.5 23 400 50 7 cyl. B.-C. DOUBLE MONOPLANES. Astra (Kapferer) Soc. Surcouf 10 40 35 7-cyl. R.E.P. 36 6 BIPLANES. Wright (Model) Cie. Navigation Aerienne 12.5 450 22 4-cyl. B.M. Farman (No.1) Voisin Freres 10.2 52 500 50 8-cyl. Antoinette Delagrange (No.3) Soc. d'Encouragement 10.5 40 450 50 8-cyl. Antoinette Bleriot (No.10) (3-seater). Bleriot 13 65 480 50 8-cyl. Antoinette Lejune (No.1) Lejune 6.5 23 150 12 3-cyl. Buchet SPECIAL. Breguet helicopter-aeroplane. Breguet 14 60 550 50 8-cyl. Antoinette

A Frenchman by the name of Vaniman has constructed a triple-surface machine with which he has made, at least, one successful flight. The vertical horizontal rudders are in front, the moveable wing-tips at the end, and a good sized stabilizing tail at the rear.

Bleriot's new biplane seems to have attracted much attention at the salon. Bleriot is using a triple surface vertical rudder in front. His horizontal rudders are affixed at the apex of two triangular vertical surfaces, one to port and one to starboard. The function of these triangular surfaces is to keep the machine from sliding in the act of turning. Judging from the size of the radiator employed, Bleriot certainly means to keep his engine cool. G.H.B.

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXXI Issued MONDAY, FEB. 8, 1909

ASSOCIATION'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell Assistant Editor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO.XXXI ISSUED MONDAY FEB. 8, 1909.

Beinn Bhreagh, Near Baddeck, Nova Scotia .

TABLE OF CONTENTS .

ILLUSTRATIONS .

EDITORIAL NOTES AND COMMENTS .

PATENT MATTERS .

Jan. 28, 1909 :—Attention is directed to the correspondence with Messrs. Mauro, Cameron, Lewis & Massie relating to the pending application for a patent on the Hammondsport work of the Association. The application has not yet been filed in the Patent Office and will not be filed until we have decided upon the names to be appended to it as inventors. We will take this ? m atter up for decision as soon as Mr. Curtiss arrives.

Mr. and Mrs. Curtiss are now on their way here. A telegram from Mr. Curtiss from Bangor, Maine led us to expect their arrival at Iona last night but they have not yet appeared. A.G.B.

Feb. 5, 1909 :—Mr. and Mrs. Curtiss arrived at Beinn Bhreagh Friday, Jan. 29. A formal meeting of the Aerial Experiment Association was held the same evening, and the following members were present:— A.G. Bell, F.W. Baldwin, J.A.D. McCurdy, and G.H. Curtiss; also present by invitation Mr. Gardiner H. Bell. The subject of the inventorship of the various claims was discussed. The discussion was continued Monday, Feb. 1, until all the claims had been taken up seriatim. My letter to Mauro, Cameron, Lewis & Massie of Feb. 2 giving the results of our investigation (see this Bulletin) has been unanimously approved. A.G.B.

2

MISCELLANEOUS COMMUNICATIONS .

Mauro, Cameron, Lewis & Massie to Bell .

To A. G. Bell, Baddeck, N.S.

Washington, D.C., Jan. 19, 1909 :— We herewith enclose carbon copy of the specification in the Aerodrome case for consideration of yourself and your associates, and particularly for you to discuss and determine as to who are to be included as the joint inventors of the subject-matter of the claims.

Mr. Cameron is very clearly of the opinion that the entire specification has been much improved as the result of the suggestions which you have offered, and also feels that the claims have been much strengthened particularly by the addition of the present claims 13 ? t o 16 inclusive, and by omitting from many of the claims the suggestion that the lateral rudders are necessarily balancing rudders; the omission of this word from the claims and the clause in the specification which points out that these rudders may perform other functions materially increase the scope of the application.

As soon as we receive instructions from you as to who are the inventors of the subject-matter claimed we will prepare a power of attorney for execution and send it to you together with the copy to be officially filed in the Patent Office.

We presume that you are aware of the requirements of the law as to what constitutes joint inventorship, but in order that there may be no misunderstanding on this subject, 3 2 we have to say that whenever two or more persons jointly collaborate to produce a given invention, even though one of the parties contributes but a very small proportion thereof, he is nevertheless a joint inventor with the others if his contribution entered in the invention to be covered by the patent. And the invention to be covered by the patent is, as you will understand, to be determined by the claims.

For the purpose of determining whether or not Lieut. Selfridge was a joint inventor of any part of the subject-matter claimed, we would suggest that the members of the A.E.A. get together and carefully read each of the claims in turn and decide whether Lieut. Selfridge in any way contributed to the perfection of the invention defined by any of said claims. If he did, then he was a joint inventor. If he did not, then he was not a joint inventor. The same of course is true in regard to every other member of the Association.

Awaiting your decision on this question and thanking you for the patience you have displayed and the helpful suggestion which you have offered, we remain, Yours very truly, (Signed) Mauro, Cameron, Lewis & Massie.

4

Bell to Mauro, Cameron, Lewis & Massie .

Messrs. Mauro, Cameron, Lewis & Massie, 620 F Street, Washington, D.C.

Baddeck, N.S., Jan. 25, 1909 :— Your note of Jan. 19 was received in due course together with a copy of the amended specification for the consideration of the members of the Aerial Experiment Association.

I have postponed the discussion of the names to be appended to the application as inventors, until the arrival of Mr. G.H. Curtiss from Hammondsport, so that all the surviving members of the Association may be together at the time.

Mr. Curtiss has not yet arrived but is expected here very soon. In the meantime, while waiting for him, Mr. Bal ? d win and Mr. McCurdy have gone over the specification with me to see whether we can suggest any amendments; and I enclose a few points that have come up during our discussion for your consideration.

I should be much obliged if you could send a telegram for our guidance in deciding the matter of inventorship concerning the following points on which we need light.

(1) If a member has contributed the subject-matter of some of the claims and not of others, is he entitled to sign the application as a joint inventor of the whole?

(2) If he has contributed suggestions described in the body of the specification but not claimed, is he a joint inventor?

5

2 (3) If he has contributed suggestions embodied in our machines, but neither described nor claimed in the specification, is he a joint inventor?

(4) My own impression is that a joint inventor must have contributed some of the matter claimed; and that if he has contributed to one claim he is a part inventor of the whole. Suppose however that this claim should not be allowed by the Patent Office what would his status be? Would his name have to be removed from the list of signers after the patent has been allowed?

Yours sincerely, (? S igned) Alexander Graham Bell.

SUGGESTIONS .

(Jan. 25, 1909)

Claim I :— Would it be advisable to specify that the supporting surfaces are concave or convex "in the lateral direction ".

We use surfaces which are concavo-convex both in the fore-and-aft direction, and in the lateral direction. They are placed with their lateral concavities towards one another but not their fore-and-aft concavities. I presume that the claim, as expressed, would cover the latter case also, although we make no reference in the body of the specification to the possibility of arranging surfaces with the fore-and-aft concavities towards one another; nor to any advantages that might arise from the arrangement, unless the last paragraph on p. 3 can be interpreted to apply to curvatures 6 3 in both directions (fore-and-aft and lateral ?) . Can we interpret a claim to cover cases not specified or alluded to in the body of the spec c i fication?

On p. 12, line 18 allusion is made to the "spar like" tapering of the machine. An ideal "spar" would be cylindrical in cross-section, thick in the middle and tapering gradually towards the ends.

If the superposed supporting surfaces formed portions of the surface of such a spar, the concave sides of both surfaces would be towards one another in whatever direction we measured the concavity. Such an arrangement presents advantages from s a structural point of view, permitting of bowstring trussing in both the lateral and fore-and-aft directions.

The opposed fore-and-aft curvatures would also minimize the disturbing effects of sudden gusts of wind from the front or rear just as the opposed lateral curvatures minimize the disturbing effects of side gusts. We have not however employed this construction in our machines because the lifting-power of a supporting surface is greater when its concave side is below than when it is above, so that we have preferred to have all our supporting surfaces concave below in the fore-and-aft direction.

If you consider it desirable to change the language of the claim so as to refer only to surfaces curved “in the lateral direction” then the word “concavo-convex” should be also limited in claims, 2,3,5,6,7,8,9,10,11,12,18,19,32 & 42. 7 4 I am by no means certain that any change would be an improvement, but if unchanged it might be well to make some reference in the body of the specification to the possibility of utilizing opposed fore-and-aft concavities.

Specification p. 15 line 3 :— “have as their sole function”. Cut out the word “sole” so as to read:— “Have as their function”. It seems to be unnecessary to limit the function here especially as we point out later that these rudders may have other functions. A somewhat similar expression occurs on p. 19 lines 4–5:— “when the balancing rudders are employed solely for maintaining or restoring the equilibrium of the machine etc”. This is unobjectionable for the function is not limited:— It is only “when” they are employed solely for this purpose etc.

Claim 13 :— This is a broad claim of great importance if it can be sustained. Mr. Baldwin suggests that a still broader claim might be added:—

“In a flying-machine a truss-like structure containing members thin in cross-section in one direction, and means supporting said members against deflection in that direction”.

Mr. Baldwin thinks that none of the claims so far prepared covers an important case he has in mind to remedy certain defects found in the Phillips flying-machine.

In this machine a large number of superposed wooden supporting surfaces somewhat resembling the slats in a Venetain Blind, are employed. Theoretically the surfaces, which

8 5 are aero-curves of a good design, should have great lifting power; but the machine did not, as a matter of fact, develop the efficiency expected.

Mr. Baldwin thinks that the trouble lay in the large number of vertical struts required to hold the horizontal slats in position, which by their weight and head resistance reduced the efficiency of the machine as a whole. Most of these vertical struts could he says, be replaced by vertical tension wires producing rigidity without much weight or head resistance.

In this case the members requiring support against deflection would be horizontal instead of as in our case vertical; and the tension wires would be vertical instead of horizontal as in the cases alluded to in our specification. Claim 13 would cover the case if the horizontal slats could be considered as “compression” members, which is doubtful. In claims 14 and 16 the members to be supported are distinctly stated to be vertical; and in claim 15 the members are supported against “lateral” deflection. It thus appears that none of the claims, with the possible exception of 13, covers the case Baldwin has in mind.

Claim ? 1 4: — There is a mistake in the wording of this claim. It says that the vertical compression members are thin in “a fore-and-aft” direction. It should read “thin in the lateral direction”.

Claim 20, line 5: — The claim states that the lateral rudders are each mounted to turn “on a horizontal axis”. 9 6 This is not clear; for a rudder mounted with its axis parallel to the fore-and-aft medial line of the structure might be horizontal, but would not constitute the kind of rudder we use, in which the axes are substantially at right angles to the medial line of the structure.

Mr. McCurdy also points out that the axes actually shown in the specification are not horizontal, but only approximately so, following the general curve of the front edge of the machine.

I would point out that horizontality is not a necessary feature either of the axes or surfaces of the rudders.

In their normal position the surfaces are driven edgeways through the air; fore-and-aft lines in the planes of the surfaces being parallel to the line of advance, or line of thrust. The axes are substantially at right angles to the line of advance or line of thrust, but are not necessarily horizontal. We aim to make them radial to the central longitudinal axis of the machine but considerable divergencies from the radial direction would not materially interfere with their operation.

How would it do to amend claim 20 lines 4–5, “each mounted to turn on a horizontal axis” by cutting out the words “on a horizontal axis” and substituting “upon an axis at right angles to the said fore-and-aft medial line of the structure and substantially radial thereto”; or “upon an axis radial to the said fore-and-aft medial line”.

10

7 I do not think that any of the claims for the balancing rudders cover a case in which the radial axes are oblique or vertical; for, claims, 17,18,19,20,21,22,23,24,25(, ?) 26,27,28,29,30, refer to the balancing rudders in such a way as to indicate that their surfaces are normally horizontal. In some of them they speak of “a zero angle of incidence”, that is horizontal. In others the axis of rotation is horizontal etc. I don't think any of them would cover a rudder placed above the machine with its radial axis vertical and its surface vertical. So that none of the claims seem to me to cover the essential idea involved that the axis should be at right angles to the medial line of the structure and substantially radial ther t e to .

Claim 31:— Should I think be amended so that no portion of a balancing rudder should be described as constituting “a part” (line 3) of the supporting surfaces, in view of the Wright patents. The projection forming the axis for the rudder should be described as something added on, and distinct from the supporting surfaces, and not “a part” of them.

Claim 34, line 5 :— Mr. McCurdy points out that the shaft referred to does not revolve but only the wheel attached to it.

Claim 36 :— Same remark. A "revoluble" shaft is incorrect. It is only the wheel attached to it that revolves.

Claim 42: — Mr. Baldwin thinks that this claim should be omitted, as some detail of the method employed in rendering the truss members adjustable was not original with any of 11 8 the mem ? b ers. I have pointed out to him that we do not claim this by itself, but only as an element in a combination which is new and original with us or some of us, so that I personally see no necessity for cutting it out, although I have no objection to doing so if thought best. A.G.B.

Telegram .

Mauro, Cameron, Lewis & Massie to Bell .

Washington, D.C., Jan. 30, 1909 :— Answer to your first question yes. Second and third questions no. Fourth question new application would have to be filed.

(Signed) M.C.Lewis & m M assie.

12

Bell to Mauro, Cameron, Lewis & Massie .

To Messrs. Mauro, Cameron, Lewis & Massie, 620 F Street, N.W., Washington, D.C.

Baddeck, N.S., Feb. 2, 1909 :— Many thanks for your telegram of the 30th ult.

Messrs. McCurdy, Baldwin and Curtiss are here, a ? n d have gone over very carefully with me your specification on the Hammondsport work of the Aerial Experiment Association; and, in accordance with the recommendation contained in your note of

Jan. 19, we have taken up the claims seriatim to ascertain who had, and who had not, contributed the subject-matter of each claim.

As the result of our investigation we have unanimously come to the following conclusions: —

(1) McCurdy, Baldwin, Curtiss, Selfridge, and Bell have each contributed to the subject-matter of some of the claims.

(2) Mr. F.W. Baldwin alone has contributed the subject-matter of claims 1,2,3,4,5,6,7,8,9,10,11,13,14,15 & 16.

Under these circumstances we should be glad to have your opinion as to whether it would be better to make this a joint application in the names of all the members of the Aerial Experiment Association, including Lieut. Selfridge; or to make two applications, one in the name of Mr. F.W. Baldwin alone, and the other a joint application.

We should be much obliged if, in deciding this matter, you would consult with Mr. Charles J. Bell who will act as Trustee of the Association; and to whom, as such Trustee, the patents should be assigned. (Signed) Alexander Graham Bell

13

Blanchard to Bell .

To A.G. Bell, Baddeck, N.S.

Baddeck, N.S., Feb. 2, 1909: — Please find enclosed a short illustrated article which may commend itself to the “Bulletin”.

(Signed) H. Percy Blanchard.

DISTRIBUTION OF SUSTAINING PLANES .

The accompanying sketch, Fig.I, combines two thoughts. Dr. Bell has found that a large single surface has not the sustaining power of the same surface broken up into distributed units. This is one of the distinguishing features of the tetrahedral cell. Following out the same thought and applying it to the single or double decker Wright machine or its like, it might be possible to eliminate more than half the surface friction by subdividing the plane into “slats”. These for more efficiency might be concaved on the bottom. It is possible that a very thin pine or spruce slat combining rigidity with lightness might be more practicable than silk considering the “backing” it would need. As this slat would need to be manufactured as moulding is made, a ribbed edge and fluted back (as Fig.3) could be given for strength.

Fig.I shows an end of a wing of a combined slatted aeroplane, with a three wayn “nest” of tetras. The view is from below. An open space of its own size is left between each “nest”. In this way also is equalized the air resistance above with below.

14

Fig one Combination “ ” with planes. This “double of planes is plan usual in that it is made of thin strips of bine concave shaped by machinery and the strips about double their own width apart, with air space between

Fig 3 cross section of Slat.

Fig two. Several light blades for propellers instead of one large blade — Three small (front) blades to right 2 hinder ones to left — Concentric all.

H.P.B. Feb 1/09-

15

2 In Fig. 3 there is shown the same thought of distributed surfaces. With the blades mere knife blades and distributed a high speed might be maintained with great efficiency and yet

avoid “cavitation”. The picture shows the two sets of propellers rotating contra as driven by the turbine referred to in a previous article.

H. Percy Blanchard.

Bell to Blanchard.

To H. Percy Blanchard, Esq., Baddeck, N.S.

Baddeck, N.S., Feb. 2, 1909 :— Many thanks for your note and interesting article entitled “Distribution of Sustaining Planes”.

Your are mistaken in supposing that I have found “that a large single surface has not the sustaining power of the same surface broken up into distributed units”.

The contrary is the case. The advantage of the breaking up of the surface has reference to increase of stability produced by limiting the possible change in the position of the center of pressure to a small surface instead of a large one.

The “sustaining power” seems to be greater with a continuous surface than with the same surface cut up into smaller pieces.

(Signed) Alexander Graham Bell.

16

REPORT CONCERNING SHIPMENT OF THE “SILVER-DART: By the Secretary of the A.E.A.

Beinn Bhreagh, Feb. 5, 1909: — We have not yet received any acknowledgment of receipt of the cheque for $86.91 sent to the Express Agent at Iona as full payment of the expressage on the “Silver-Dart” as by his bill of Jan. 15, although we know that he did receive it, from Mr. Curtiss who happened to be there at the time, and from Mr. Dave Dunlap the mail-carrier.

In order to find out whether the Company has accepted the cheque the following telegram has been sent to Bell & Company, Bankers, Washington, D.C., upon which bank the cheque was drawn.

Telegram .

McCurdy to Bell & Co.

Baddeck, Feb. 4, 1909: —Please wire me when cheque Number seventy-two payable MacDonald, Agent Canadian Express Co. is received.

(Signed) J.A.D. McCurdy.

Mr. David Dunlap has handed to us a copy of a telegram from J. Bryce to the Express Agent at Iona, dated Jan. 27, which reads as follows:—

17

Telegram .

Bryce to Agent Can. Exp. Co. Iona.

Montreal Jan. 27, 1909 :— Graham Bell wires he is prepared to pay regular rate but will not pay for special car. Right charges from Suspension Bridge to Iona, even if all of shipment handled in regular cars would be double rate, or one hundred and sixty dollars and twenty-eight cents. Deliver on payment of this amount. Advise if delivery accepted and rush empty car back.

(Signed) J. Bryce.

After conference with Mr. Bell I have to-day sent the following telegram to the Express Agent at Iona:—

Telegram .

McCurdy to MacDonald .

Baddeck, Feb. 5, 1909: —Please wire acknowledgment of receipt of cheque mailed you Jan. 28, and state whether we can have delivery at once.

(Signed) J.A.D. McCurdy.

This brings the matter up to date.

(Signed) J.A.D. McCurdy, Sec. A.E.A.

18

LANCHESTER'S COMPARISON OF THE WRIGHT MACHINE WITH THE VOISIN MACHINE: By J.A.D. McCurdy.

Beinn Bhreagh, Feb. 5, 1909 :— In the British Aeronautical Journal for Jan. 1909, Mr. F.W. Lanchester institutes an interesting comparison between the Wright machine and the Voisin machine.

The Wright Machine :— The Wright machine of the present day weighs complete, when mounted by the aviator, 1100 lbs., and has a total supporting surface of 500 sq. ft. approximately, which gives a flying weight of 2.2 lbs. to the sq. ft. The ordinary velocity of flight is 40 miles an hour, or 58 feet per second. The surfaces are approximately 40 feet long, 6.2 feet wide, the plan form being nearly rectangular, the extreme ends only being partially cut away and rounded off. The total area of auxiliary surfaces, including front control, rudder, and vertical half-moon fins, is about 150 sq. ft. The motor used, four cylinder vertical type 4 ¼ × 4; total weight of the motor is 200 lbs., and its power 24 B.H.P. at a speed of 1200 R.P.M.

Mr. Wright has stated to the author, Mr. F.W. Lanchester, that he could fly with as little as 15 or 16 H.P., carrying no passenger. His gliding angle he reported to be about 7°.

The Voisin Machine: — The Voisin machine, as exemplified by that of Mr. Farman, weighs complete, with Mr. Farman, 1540 lbs., and has a total supporting surface of 535 sq. ft. which gives a flying weight of 2.879 lbs. per sq. ft.

19

The ordinary speed of travel is 45 miles per hour, or 66 ft. per second. The total area of his vertical surfaces is approximately 255 sq. ft. These are described as members whose function is to preserve and control the direction of flight and to give lateral stability. The main surfaces are rectangular in plan form 10 m × 2m, which gives a ratio of length to depth equal to 5. The tail in this machine is approximately square in plan form.

The motor is an 8 cylinder Antoinette 4.35 inches by 4.15 inches, which is stated to give 49 B.H.P. at about 1100 R.P.M. Its weight is 265 lbs. The angle of flight of this machine owing to recent improvements has been reduced from 11 to 9°.

Comparison .

Weight: — The Voisin machine is 40% heavier than that of the Wright Brothers. The passenger capacity of the two machines is id ?? en tical. There is however one feature in which the machines differ, and which is unquestionably responsible for much of the difference in weight. The Voisin machine is fitted with a chassis with four wheels mounted to swivel freely. The front wheels are provided with a spring suspension to diminish the shock of landing. The Wright machine has no such provision but possesses instead a pair of wooden runners of comparatively little weight. The difference in these two methods is favorable to the Wrights from a weight standpoint to the extent of 60 or 70 lbs.

Horse Power :—The next point of comparison is that of the horse power employed as related to the weight and 20 velocity, thus touching on the question of relative efficiency of the two machines. The author has shown that for equal perfection of design the resistance to flight of two machines of equal weight is approximately independent of the velocity of flight consequently the horse power will vary directly as the velocity of flight, and the Voisin machine is entitled to more power not only on account of its greater weight but also on account of the greater velocity. In the absence of more exact information we may take the velocity of the Voisin machine as being 10% greater than that of the Wright. This is roughly in accordance with the figures given.

The declared B.H.P. of the motors is sometimes not very reliable, it is customary to use the expression in a rather elastic manner. From theoretcial formulae , assuming a mean pressure of 72 lbs. to the square inch we have at the speed corresponding to the B.H.P.

Wright @ 1200 revolutions 24.7

Voisin @ 1000 revolutions 49.2

On the above basis the Wright machine is fitted with 1 B.H.P. for every 45 lbs. sustained while the Voisin machine only sustains 31 lbs. for every B.H.P. Providing the Voisin machine was as efficient as the Wright machine 38.5 B.H.P would place the machine on equal footing; in other words the Voisin machine has an ? e xcess in B.H.P. of 28%. This loss of efficiency Mr. Lanchester thinks is not so much due to the machine itself but rather to the propeller employed.

21

Propellers: — The Wright machine is driven by two propellers 8 ft. 6 inches in diameter having an effective pitch of about 9 feet 6 inches. These propellers are mounted on parallel shafts 11 feet 6 inches apart and are driven in opposite directi ? o ns by chains direct from the motor shaft, ? o ne chain being crossed. The gear ratio is 10:33.

The Voisin machine is propelled by a single screw of 7 ft. 6 inches in diameter of which the effective pitch is approximately 3 ½ ft. This propeller is driven direct being keyed to the crank-shaft of the engine. The pitch ratio or the diameter in terms of the effective pitch is in the two cases, Wright .88 and Voisin 2.1. Mr. Lanchester ? h as found the efficiencies corresponding to these pitch ratios and including the 5% loss owing to chain drive in the Wright machine; Wright .63, Voisin .54.

Mr. Lanchester finds that the theoretical ? g liding angle should be 7° for the Wright machine, and 7° 40# for the Voisin machine. It would thus appear that in addition to being considerably less efficient in its screw propeller the Voisin machine is also slightly less efficient considered as a glider. That is to say, its gliding angle is not quite so good as that of the Wright machine. He ? s uggests that this may be due to the greater depth of surface in proportion to its length of the Voisin machine compared with that of the Wright Brothers.

A table comparing the resistance of the two machines shows that while the thrust of 155 lbs. would suffice in the case of the Wrights 225 lbs. is required in the Voisin machine

22

Mr. Lanchester concludes his theoretical remarks by saying:—

“On the whole the advantage certainly rests with the Wright machine from the aerodynamic standpoint”.

Longitudinal stability :— From his remarks on longitudinal stability Mr. Lanchester seems to think that the Voisin machine is just as stable as the Wright machine if not a little more so.

Lateral Stability :— ? I n the case of lateral stability, Mr. Lanchester says as long as the flight is preserved in a straight line the stability of the one machine is as good as the other.

The fact is that the secret of stability is contained in the one word “velocity”. In negotiating a turn the Wright machine, on account of its construction which allows the operator to warp the surfaces at will, undoubtedly has a great advantage over the Voisin machine. This warping enables Mr. Wright to turn with his wings canted to nearly 30° on a radius of perhaps not more than 6 ? 0 or 70 yards. Farman on the other hand must necessarily turn in a leisurely manner employing a circle of considerable radius. Mr. Lanchester says:—

“Summarizing the comparison from an aerodonetic standpoint, the author is inclined to think that the Voisin machine has the advantage as containing more of the features that will be embodied in the flying machine of the future”.

As regards propulsion Mr. Lanchester thinks that the Wright disposition of propellers is a source of danger.

J.A.D. McC.

23

FURTHER REPORT CONCERNING SHIPMENT OF THE “SILVER-DART”: By the Secretary.

Beinn Bhreagh, Feb. 6, 1909 :— I have just received the following telegram from the Express Agent at Iona regarding the shipment of the“ ? S ilver-Dart”:—

Telegram .

MacDonald to McCurdy .

Iona, N.S., Feb.6, 1909 :— Received cheque and forwarded same to Company together with receipt which you enclosed. Will be pleased to deliver balance of shipment on payment of Eighty dollars and fourteen cents.

(Signed) M.A.J. MacDonald

In reply I have sent the following note to the Agent at Iona:—

McCurdy to MacDonald .

Beinn Bhreagh, Feb. 6, 1909 :— Just received your wire in reply to our telegraphic enquiry stating that you had received our cheque for $86.91 and would deliver flying machine shipment on payment of an additional charge of $8 ? 0 .14.

As the Canadian Express Co., by their voluntary action in reducing the charge from over $500.00 to the amount now demanded, namely $167.05, have implied that they wish to act fairly in the matter, we will pay the additional charge of $80.14 under protest.

If you will be kind enough to let me have the name of the proper man in the Express Co. to confer with, we will take the matter up directly with the Head Office of the Company and hope that they will see fit to settle the matter of charge equitably.

We take this stand because if we do not have immediate delivery of the goods they will be absolutely valueless to us in a very short time.

24

In accordance with the above statement I therefore enclose cheque for the amount of eighty 14/100 dollars ($80.14) for which I request receipt.

Please deliver the two crates into the charge of Mr. David Dunlop or his agent for immediate tra ? n sportation to Baddeck.

We thank you for the trouble you have personally taken in the matter of adjustment.

(Signed) J.A. Douglas McCurdy. Sec. Treas. A.E.A.

Mr. David Dunlop and some of the Laboratory Staff go to Iona this afternoon for the machine and we hope that the “Silver-Dart” with the exception of the engine will arrive at the Laboratory this evening.

Mr. Curtiss has telegraphic advise that the engine was shipped from Hammondsport, Feb. 4, so we expect to receive it on Monday Feb. 8.

(Signed) J.A.D. McCurdy, Sec. A.E.A.

25

THE OUTLOOK ON AVIATION: By the Asst. Editor.

The Officers chosen for the Aero Club formed not long ago in Washington are as follows: — Truman H. Newbury, Secretary of the Navy, was elected President, Robert Shaw Oliver, Asst. Secretary of State was elected First Vice President, Thomas N. Page, Second Vice President, Butler Ames, Third Vice President; corresponding Secretary, Dr. Allerton Cushman, recording Secretary Dr. A. F. Zahm, Treas. Mr. Charles J. Bell.

Eichenfels, an architect of Minneapolis has a model of an aeroplane on which he has been working for five years. In appearance it resembles the “June Bug”. The top plane is arched in the shape of a hood as the inventor believes that this form of structure will give the greatest lifting power.

W.R. Tinken a wealthy Canton Manufacturer is said to have offered to W.H. Martin Civil Engineer and Farmer a prize of $100?000 if the latter can successfully negotiate the distance of a hundred miles in his aeroplane.

On Jan. 29 M. Zipfel who owns a Voisin biplane attempted to make a flight. He was unsuccessful, however, probably being due to the fact that his engine was not in good working order.

Aldershot, England, Jan. 20, 1909 :— The aeroplane with which the balloon corps of the British Army is conducting experiments again came to grief here to-day.

26

On Jan. 16 the French Cabinet requested President Fallieres to confer upon distinguished foreign and French aeroplanists including the Wright Brothers 16 crosses and one decoration of commander of the Legion of Honor.

There is given in the Aeronautical Journal for Jan. a comparison between the Wright and Farman type of aeroplane. It takes up each feature of each machine and gives comparisons and remarks. It is probably one of the most interesting articles of its kind which we have had. G.H. ? B.

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXXII Issued MONDAY, FEB.15, 1909

ASSOCIATION'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell Assistant Editor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO.XXXII ISSUED MONDAY FEB. 15, 1909.

Beinn Bhreagh, Near Baddeck, Nova Scotia.

TABLE OF CONTENTS .

Illustrations .

1

EDITORIAL NOTES AND COMMENTS .

Gardiner Bell's flying toy .

Jan. 26, 1909 :— In view of the termination of the Association on its present basis at the end of March attention has been called at various times to the absolute necessity of providing some income to the Association from its work if it is to continue in operation after the 31st of March when its subsidy from Mrs. Bell ceases. Since the organization of the Association there has been a continuous out-go of money and no in-go with the result that it becomes impracticable to continue the Association beyond its allotted term unless other means of support can be found than have so far been provided. I am unwilling that Mrs. Bell should be called upon for further financial support than she has promised to give. I have suggested at various times that one of the best ways of securing financial means to continue experiments by our own exertions in a short time would be to take advantage of the general interest of the public in the subject of flying-machines by putting on the market a flying toy of such cheap construction as to be sold at a profit for a very small amount. Of course we cannot interrupt important experiments for this purpose, but it has seemed wise that we should give some thought to the matter as a promising means of bringing in quick returns and dispensing with financial aid. I have specially directed the attention of Mr. Gardiner H. Bell, our Asst. Editor to this matter. His work relates more particularly to literary matters. He has taken but little active part in 2 2 our experiments save as observer, and can best spare the time for the consideration of this subject.

On Jan. 14 Mr. Gardiner Bell submitted an idea as a basis for an attractive toy. It is well known that a long and narrow slip of paper is allowed to drop whirls round in the air upon a horizontal axis and descends very gently to the ground. Mr. Gardiner Bell has made experiments to ascertain the best dimensions for such a whirling slip, and on Jan. 14 submitted a slip of paper about 10 × 4 cm (Fig. 1), which whirled very well and in an attractive manner. He also informed us that he had tried a sheet of blotting paper of larger size but of the same relative dimensions with a pin placed at either end in the axial line from which was suspended a sort of swing of wood, and that the whirling surface supported its load in the air in a very promising manner. He did not however exhibit this in operation at that time (Jan. 14) and he was requested to do so as soon as possible.

In the meantime the feasibility of a simple whirling toy on this principle was discussed and some old Laboratory models were hunted up made of silk upon a framework of wood which had been used a year or so ago to investigate the effect of varying the dimensions of the surface upon the rate of whirl. One of these aeroplanes was selected and given to Mr. Gardiner Bell to make experiments with.

On Jan. 22 Mr. Gardiner Bell showed this whirling aeroplane in operation carrying a swing of wood (Fig. 2), and it was decided that this formed a very promising basis 3 3 for an attractive toy.

I suggested two whirling wings supporting between them the figure of a man (Fig. 3).

Mr. Gardiner Bell suggested coiling a string around an axis and pulling it so as to give a good initial rotation; and I suggested a small central balance wheel to keep up the rotation.

On Jan. 23, Mr. Gardiner Bell submitted a model shown in Fig. 4 to carry out the idea of central loading. This was of silk with a framework of wood.

I submitted a whirling sheet of stiff paper with a steel knitting needle run through it as a central axis, Fig. 5. This whirled very well but with a curious flapping noise suggesting the idea that the axis of rotation was not in the middle line of the paper where the knitting needle was placed but that the load swung around the axis of rotation occasioning the flapping sound.

During my recent visit to Washington I met the Hon. Butler Ames, Representative from Mass. at the White House, and learned from him that he is employing whirling aeroplanes in an actual flying-machine with which he is experimenting. A.G.B.

4

ICE-BOAT ACCIDENT . CURTISS HURT.

Feb. 9, 1909 :— Mr. Curtiss sustained a frightful looking wound in the ice-boat accident yesterday (Feb. 8), his lower lip having been almost torn off, merely holding by a small flesh connection on either side of his mouth. When he looked at himself in the glass he found his tongue protruding through the wound.

He was driven to the Point suffering from shock and loss of blood. Douglas McCurdy flew to town on our sailing ice-boat for a Doctor, while Miss Cadel, a trained nurse gave first aid and bandaged the wound.

Dr. MacDonald was away so McCurdy brought over Dr. McIver. He stitched on the lip, and reported that there seemed to be no other damage. Teeth all right, and no internal injury although Curtiss had been thrown against the steering wheel with such force as to bend and distort the iron rod forming the axis.

To-day (Feb. 9) Curtiss has remained in bed feeling weak and dizzy when he attempted to rise. Both Dr. MacDonald and Dr. McIver came to see him this afternoon, and report that the lip is healing satisfactorily, and that there is no other injury. He is expected to be all right in a day or two.

Feb. 11, 1909 :—Mr. Curtiss is progressing satisfactorily. The usual afternoon conference of the A. E. A. was held in his bed room yesterday (Feb. 10) so as to allow him to attend. A.G.B.

SILVER-DART .

Feb. 11, 1909 :— The remaining crates of the Silver-Dart arrived here Feb. 6, and the Hammondsport engine arrived this morning. A.G.B.

5

BRAKE TESTS .

Jan. 19, 1909 :— The following rough notes concerning brake tests made to-day were recorded by Mr. Ba ?? ld win:— A.G.B.

"To tune up engine (Curtiss No. 2) which was skipping when last used on "Query" we put brake on it.

Engine would not take advanced spark so short-circuited timer to get continuous spark. The speed was very much improved; gave 13.79 horse-power at 1254 rpm.

Ran engine idle closed ports 2152 R.P.M.

Ran engine idle open ports 2336 R.P.M.

Shortened arm of brake from 63 inches to 31 ½ inches giving circumference of 16.5 ft. so that B.H.P. = RPM × P/2000

Radius Circum P&W R RPM BHP Remarks 10 sec Closed ports 31.5" 16.5 ft 14 225 1350 9.450 Cyl. No. 3 skipping during reading I. " " 22 209 1254 13.794 " " 22 119 714 7.854 " " 17 239 1434 12.189 " " 12 242 1452 8.712 " " 13 232 1392 9.048 " " light 358.6 2152 light light open ports " " light 2236 light " " " light 2336 light "

These experiments were made simply with a view to tuning up engine. We were having some trouble with the timer but by short-circuiting it and using a continuous primary current the engine speeded up all right.

6

2 Two of the cylinders have not got good compression but as it was understood that these brake tests were not measures of the available power of the motor we did not take any trouble to locate leaks and get good compression.

F.W.B.

Gardiner Bell's Flying toy .

Jan. 22, 1909 :— Mr. Gardiner Bell made experiments with the whirling aeroplane of silk stretched upon a frame of wood, shown in blue-print Fig. 2 carrying as load a cross-bar of wood. The whole weighed 134 grams. When the apparatus was dropped from a height the aeroplane whirled round gliding across the small room in the headquarters building carrying its load.

Its behavior was so promising that it was decided to make further experiments looking to the manufacture of a flying toy. A.G.B.

Jan. 23, 1909: — Mr. Gardiner Bell made experiments with the whirling model, shown in blue-print Fig. 4, fitted to carry a central load. This was of silk with a framework of wood. It glided well when given a preliminary spin, but not so well without. A.G.B.

7

MORE TOY EXPERIMENTS .

Jan. 23, 1909: — A.G. Bell made whirling experiments with a stiff sheet of paper with a steel knitting-needle run through it as an axis as shown in blue print Fig. 5. For results see editorial in this Bulletin. Mr. Bedwin was asked to make an arrangement of wire and paper on this basis to test the practicability of the toy suggested in blue print Fig.3.

A.G.B.

Jan. 27, 1909 :— Mr. Bedwin submitted a wire frame covered with paper (Fig.6) carrying a loose swinging arm of wire suspended in the middle, loaded with a small piece of lead to represent the figure of the man in Fig.3. The apparatus whirled poorly. The wings were thought to be too wide for their length. They were then cut down, as shown by dotted lines in Fig.6, with improved results; but the whole arrangement seemed to be too heavy for the whirling surfaces employed. A.G.B.

McCURDY'S ICE-BOAT EXPERIMENTS .

Jan. 28, 1909 :— The ice-boat, to carry out McCurdy's idea of testing the push of a propeller while advancing rapidly in the line of thrust was tried to-day on the frozen surface of Beinn Bhreagh Harbor. I was not present and therefore asked McCurdy about the results of the experiment. To my surprise he said there was nothing to report, for said he, “the experiment was not an experiment, but only an ex periment (!) to test the transmission.

8

2 With the kind assistance of Miss Mabel B. McCurdy, our stenographer, who was placed in a suitable strategic position , I succeeded in capturing from McCurdy the following account of this experiment that was not an experiment at all! McCurdy said:—

“The idea was to see about the transmission. Would it hold up under the heavy propeller, a big 10 foot propeller. We just took the engine-bed and frame exactly as you had it on the “Query” and bolted it down on the ice-boat, and mounted on that the counter-shaft with the spring.

We took her out on the ice. Had a place cleaned by Manchester. Started her up all right. Ran her down on the course 100 meters in 21 seconds. We stopped her at the other end and found that the spreader was too weak and it buckled up. We tightened her up and tried her again, but it was no go.

In the meantime we noticed the push on the gauge. From the time we started, the scale moved right up to three divisions, and there were no variations. We don't know what the push was when the boat was still. Velocity was 100 meters in 21 seconds. Bedwin is going to fix the spreader. We found that the rudder was not quite strong enough, and he is going to fix it up. The spring indicator works all right.

A.G.B.

Jan. 29, 1909 :— Ice-boat tried again to-day with 10 ft. propeller, 22 ½° at tip. Curtiss No. 2 engine used. Gearing 3:I. A slight wind of perhaps 5 or 6 miles an hour was blowing down the harbor.

The object of the experiment was to ascertain whether the push of the propeller was the same when the ice-boat was in motion as when it was at rest.

9

3 The boat was first held stationary upon the ice while the push was being measured and the rotations of the propeller counted. The boat was then released and sped down the harbor with the wind, but we did not get a reading. Coming back against the wind we made a speed of 100 meters in 18.8 seconds. While she was running at this rate the push was measured on board the ice-boat, and the rotations of the propeller counted.

Result .

Ice-boat stationary Push 150 lbs at 342 rpm.

Ice-boat moving Push 150 lbs at 432 rpm.

We cannot place much reliance upon these first results; for McCurdy's device for measuring the pull is new and requires careful testing before we can accept its indications as correct. He has found that a weight of 200 lbs compresses the spiral spring to the extent of one inch, and the indicator is graduated upon this basis. A lever arm is used to magnify the motion of the spring, but numerous check observations must be made before we can feel full confi ? d ence in the accuracy of the readings. The push was the same while the machine was in motion as when at rest. I would have more confidence in the result if the two readings had been different for then we would have had some assurance that the measuring mechanism was operative. McCurdy's device looks very promising and further experiments will show how far its indications may be relied upon.

A.G.B.

10

4 AEROPLANE CARRYING A GYROSCOPE .

Jan. 29, 1909 :— Gardiner Bell made experiments with a cotton covered aeroplane carrying at its center a small gyroscope which he caused to rotate (independently of the plane) by means of a string coiled around the axis. See Fig. 7.

A.G.B.

Jan. 30, 1909 :— Gardiner Bell showed us his combined aeroplane and gyroscope (fig.7) in operation. When dropped from a height the aeroplane glides gently towards the floor whirling round as it descends.

It did not seem to make much difference whether the gyroscope was in rotation or not; or whether it revolved one way or the other.

The aeroplane whirled more gracefully, and made a more gradual descent without the gyroscope than with it.

A.G.B.

ACCIDENT TO ICE-BOAT .

Jan. 30, 1909 :— While McCurdy's ice-boat was being prepared for trial the balance-wheel shaft sheared off and further experiments had to be postponed for repairs.

A.G.B.

TESTING THE SUCTION OF A PROPELLER .

Feb. 1, 1909 :—In accordance with some suggestions from me, Mr. Wm. F. Bedwin to-day tried the apparatus shown in blue 11 5 print Fig.8, to measure the suction of a rotating propeller.

A square piece of wood, having an area of one square foot was attached to one end of a balanced beam, and a spring balance to the other. The wooden surface was placed below the propeller of the ice-boat in about the position where the water-spout was observed in the Hammondsport experiments with the “Loon”. It was expected that the wooden surface would rise, as the water had ?? do ne under the suction of the rapidly rotating propeller; and that the spring-balance at the other end of the beam would measure the value of the pull.

Result :— Mr. Bedwin reports that no measurable pull was observed, although the surface was shifted to different places under the propeller on both sides of it, and at different distances away.

Remarks :— Mr. McCurdy and Mr. Curtiss have been requested to repeat the water-spout experiment for our information. If we can reproduce the conditions that caused the water to rise we will have a basis to work upon. We already have two instruments prepared for measuring the effect. See blue print Figs. 8 & 9.

A.G.B.

THE PUSH OF AN ADVANCING PROPELLER .

Feb. 2, 1909 :— Ice-boat tried to-day with screw propeller 7 feet 8 inches diameter; 22° at tip. Wind 8 to 10 miles per hour felt on harbor. Following details compiled from McCurdy's notes.

12

6 Exp. 1. Ice-boat stationary in boat house. Propeller made 654 rpm.

Result: Thrust 150 lbs at first but speedily settled to 125 lbs.

Exp. 2. Ice-boat in motion down harbor making 100 meters in 10 seconds. Propeller 633 rpm.

Result: Thrust 100 lbs at first speedily fell to 75 lbs, and remained there till near conclusion of experiment when it rose to 150 lbs.

Exp. 3. Ice-boat in motion up harbor. Velocity 100 m in 13 sec. Propeller 558 rpm.

Result: Thrust not observed.

Exp. 4. Ice-boat in motion down harbor. Velocity 100 m in 9 sec. Propeller 1017 rpm.

Result: Thrust 155 lbs at first, but speedily settled to 100 lbs.

Exp. 5. Ice-boat stationary on the ice. Propeller 561 rpm.

Result: Thrust steady at 130 lbs.

Exp. 6. Ice-boat in motion up harbor. Velocity 100 m in 12.6 sec. Propeller 822 rpm.

Result: Thrust steady at 75 lbs.

Remarks :— The results are not very concordant but seem to indicate that the thrust of the propeller is less when the machine is in motion than when it is at rest, thus reversing the verdict given Jan. 29. It is obvious that valuable results will be obtained with McCurdy's device for measuring the thrust while in motion, but the defects of the instrument can only be ascertained by multiplying observations. We cannot yet feel full confidence in its indications.

A.G.B.

Feb. 3, 1909 :— Ice-boat propelled to-day by the “Albatross Propeller”, 8 feet, pitch 6 ¼ ft. Details compiled from McCurdy's notes.

Exp. I. ice-boat in motion down harbor. Speed 100 m in 10 sec. Propeller 759 rpm.

Result: Thrust steady at 125 lbs.

Exp. 2. Ice-boat stationary on the ice. Propeller 660 rpm.

Result: Thrust steady at 135 lbs.

Exp. 3. Ice-boat in motion up harbor. Speed 100 m in 12.8 sec. Propeller 636 rpm.

Result: Thrust steady at 50 lbs.

The following experiments were then made with another propeller 7 ft. 8 inches diameter, 22° at tip.

Exp. 4. Ice-boat stationary. Propeller 570 rpm.

Result: Thrust 135 lbs.

Exp. 5. Ice-boat in motion down harbor. Speed not observed. Propeller 680 rpm. (doubtful).

Result: Thrust 75 lbs.

Exp. 6. Ice-boat in motion up harbor. Speed 100 m in 14 sec. Propeller 504 rpm.

Result: Thrust 75 lbs.

Exp. 7. Ice-boat in motion down harbor. Speed 100 m in 12 sec. Propeller 618 rpm.

Result: Thrust 75 ? lbs.

Exp. 8. Ice-boat in motion up harbor. Speed 100 m in 15 sec. Propeller 543 rpm.

Result: Thrust 75 lbs.

Remark s:— Results of to-day's experiments are confirmatory of results obtained Feb. 2 that the thrust of the propeller is less when the machine is in motion than when it is 14 8 at rest. A.G.B.

NO WATER-SPOUT AT BEINN BHREAGH.

Feb. 3, 1909: — Mr. Bedwin reported th ? a t McCurdy and Curtiss have attempted to reproduce the water-spout phenomenon observed in Hammondsport. A large hole was broken in the ice in Beinn Bhreagh Harbor and the ice-boat backed up to it so that the rotating propeller came above the open water.

Result :— Some slight agitation of the water but no water-spout effect.

Remarks :— Mr. McCurdy and Mr. Curtiss have been requested to repeat the experiment with the new engine when it arrives here so as to have as nearly as possible the same conditions they had in Hammondsport. They can use the same engine and probably the same propeller.

A.G.B.

DRY BATTERIES AFFECTED BY CO L D.

Feb. 4, 1909 :— At a conference held Feb.3 Mr. Bedwin, in speaking of the difficulties experienced with the engine on the ice, thought that the intensity of the ignition spark varied a good deal at different times; and expressed the opinion that this might be due to the supposedly well known fact that the dry batteries, which were placed in the primary circuit of the induction coil, were affected by cold. He stated that he had measured the current produced from the batteries at a time when the engine was working badly and had found that the batteries were apparently in poor condition. 15 9 Upon placing them however near a stove they very soon recovered their power.

Mr. Bedwin was ten requested to make experiments with a number of dry cells to ascertain definitely the effects of heat and cold upon them. The experiment was made to-day, and the following results are compiled from Mr. Bedwin's note ? s .

Mr. Bedwin took then dry cells which he numbered from one to ten, and tested the strength of the current produced by each with his Voltmeter. The readings purport to be in Amperes: At least the readings are taken from the Ampere scale. The cells were divided into two groups, Nos. 1–5 and Nos. 6–10.

Exp . 1 . Time 10.45 A.M.

Cells in Normal Condition Cells Current No. I 7.0 2 7.0 3 9.0 4 8.0 5 10.0 Total 5 41.0 Aver. 8.2 NO.6 10.0 7.0 10.0 8 8.0 9 11.0 10. 11.0 Total 5 50.0 Aver. 10.0

Cells I to 5 were then placed out of doors to cool, and cells 6 to 10 were kept in doors near a stove to warm. Observations of current were then made every half hour with the following results:—

16

10 Exp . 2 . Time,11.15 A.M.

Cooling Warming Cells Current Cells Current. No.1 5.5 No.6 10.0 2 6.5 7 13.0 3 7.5 8 10.0 4 6.5 9 13.0 5 8.5 10 13.0 Total 5 34.5 Total 5 59.0 Aver. 6.9 Aver. 11.8

Exp . 3 . Time,11.45 A.M.

Cooling Warming Cells Current Cells Current No. I 5.0 No.6 10.0 2 5.5 7 13.0 3 7.0 8 10.0 4 6.5 9 13.0 5 8.5 10 13.0 Total 5 32.5 Total 5 59.0 Aver. 6.5 Aver. 11.8

Exp . 4 . Time, 12.15 (Noon)

Cooling Warming Cells Current Cells Current No. I 5.5 No.6 13.0 2 6.0 7 13.0 3 7.0 8 11.0 4 6.0 9 13.0 5 8.0 10 13.0 Total 5 32.5 Total 5 63.0 Aver. 6.5 12.6

After the noon reading the cool cells Nos.I to 5 were brought indoors to warm and the warm cells Nos.6 to 10 were put out of doors to cool. ? R eadings were then taken every half hour with the following results:—

17

11 Exp. 5 Time 12.45 (Noon)

Warming Cooling Cells Current Cells Current No. I 7.5 No.6 9.5 2 7.5 7 10.0 3 8.5 8 7.5 4 8.0 9 10.0 5 9.0 10 10.0 Total 5 40.5 Total 5 47.0 Aver. 8.2 Aver. 9.4

Exp . 6 . Time 1.15 P.M.

Warming Cooling Cells Current Cells Current No. I 9.0 No.6 8.0 2 9.0 7 9.0 3 10.0 8 7.0 4 9.5 9 8.5 5 12.0 10 8.5 Total 5 49.5 Total 5 41.0 Aver. 9.9 Aver. 8.2

Exp. 7. Time 1.45 P.M.

Warming Cooling Cells Current Cells Current No. I 9.5 No.6 8.0 2 9.0 7 9.0 3 10.5 8 7.0 4 10.0 9 8.0 5 12.0 10 8.0 Total 5 51.0 Total 5 40.0 Aver. 10.2 Aver. 8.0 18

12 Exp . 8 Time 2.15 P.M.

Warming Cooling Cells Current Cells Current No. I 10.0 No.6 7.5 2 10.0 7 8.5 3 10.0 8 6.0 4 10.0 9 8.0 5 12.0 10 7.0 Total 5 52.0 Total 5 37.0 Aver. 10.4 Aver. 7.4

SUMMARY TABLES .

Aggregates .

Experiment Time Cells Cells 1–5 6–10 Normal Normal Exp. I 10.45 41.0 50.0 Cooling Warming Exp. 2 11.15 34.5 59.0 Exp. 3 11.45 32.5 59.0 Exp. 4 12.15 32.5 63.0 Warming Cooling Exp. 5 12.45 40.5 47.0 Exp. 6 1.15 49.5 41.0 Exp. 7 1.45 51.0 40.0 Exp. 8 2.15 52.0 37.0

GENERAL AGGREGATES .

Cells Normal Cool Warm Obs. Sum. Obs. Sum. Obs. Sum. Nos. I to 5 5 41.0 15 99.5 20 193.0 Nos. 6 to 10 5 50.0 20 165.0 15 181.0 Total 10 91.0 35 264.5 35 374.0 19

13 AVERAGES .

Experiment Time Cells Cells 1–5 6–10 Normal Normal Exp. I 10.45 8.2 10.0 Cooling Warming Exp. 2 11.15 6.9 11.8 Exp. 3 11.45 6.5 11.8 Exp. 4 12.15 6.5 12.6 Warming Cooling Exp. 5 12.45 8.1 9.4 Exp. 6 1.15 9.9 8.2 Exp. 7 1.45 10.2 8.0 Exp. 8 2.15 10.4 7.4

GENERAL AVERAGE .

Cells Normal Cool Warm Nos. I to 5 8.2 6.6 9.6 Nos. 6 to 10 10.0 8.2 12.1 General Average 9.1 7.6 10.7

Remarks :— The temperature evidently exerts a considerable influence upon the efficiency of the cells. We may learn from these experiments that it may prove important to the successful operation of our engine that the batteries used to produce the ignition spark should be protected from the cold. More than this: It would be wise to provide some means of keeping them warm. A.G.B.

20

14 TOY MODEL OF “QUERY ”.

Feb. 4, 1909 :— Some time ago I requested Mr. Bedwin to have a toy hydrodrome made after the model of the “Query” that could be floated in water and towed by a string, as I thought that such a toy might prove attractive to children. To-day he produced a beautiful little model of the “Query”, made by Mr. McNeil. The whole model is made of tin with tin hydro-curves of proportionally the same size as those upon the “Query”. I floated this model in a bath-tub and towed it with a string, but it did not rise out of the water. The hydro-surfaces are too small to permit it to rise at a moderate speed. This finely finished machine will be preserved as a model of the “Query” just as it is; and I have asked Mr. Bedwin to have another toy hydrodrome made, of cruder construction, and with larger hydro-surfaces. A.G.B.

EXPERIMENTS WITH McCURDY'S ICE-BOAT (CONTINUED)

Feb. 5, 1909 :— The ice-boat was tried again to-day.

Exp. I. Ice-boat in motion down the harbor carrying four persons. Speed 100 m in 16 seconds. Propeller 489 rpm.

Result: Thrust 40 lbs.

Exp. 2 Moving up the harbor with 4 persons. Speed 100 m in 13 seconds. Propeller 507 rpm.

Result: Thrust 70 lbs.

Exp. 3. Moving down harbor with 3 persons. Speed 100 m in 12 seconds. Propeller 228 rpm.

Result: Thrust 75 lbs.

21

15 Exp. 4 Moving down with 3 persons. Speed 100 m in 10 seconds. Propeller 1114 rpm.

Result: Thrust 75 lbs.

Exp. 5 Moving up with 3 persons. Speed 100 m in 11.8 seconds. Propeller 651 rpm.

Result: Thrust 70 lbs.

Exp. 6. Ice-boat stationary. Propeller 624 rpm.

Result: Thrust 100 lbs.

Exp. 7. Moving down. Speed not noted. Propeller 524 rpm.

Result: Thrust 100 lbs at first, then steady at 75 lbs.

Exp. 8. Moving up. Speed 100 m in 12 seconds. Propeller 510 rpm.

Result: Thrust started at 75 lbs, and became steady at 50 lbs.

Remarks :— All the observations seem to indicate less thrust when the machine is in motion than when at rest: But the results are not sufficiently concordant to be reliable.

Feb. 6, 1909 :— Mc Curdy reports another experiment which was not an experiment. He says:—

“We have discovered that friction in a bearing in connection with our push indicator has resulted in a state of affairs in which the proper amount of push of the propeller would not be registered by the pointer. I therefore feel, that all the propeller test results obtained so far are not to be relied upon”.

A.G.B.

22

Feb. 8, 1909:— The following account of experiments made this afternoon has been handed to me by Mr. McCurdy:—

“ This afternoon (Monday, Feb.8) it was planned to test out the ice-boat as usual with the idea in view of getting some propeller data. The ice was in good shape and a northeast wind was blowing up the harbor having a velocity of about 25–30 miles an hour.

The propeller used was a 7 ½ foot diameter, 22° at tip (not a perfect screw). It was geared at 2-1. Mr. Curtiss took the wheel, Mr. Bedwin ran the engine, and McCurdy attempted to obtain the readings in the usual manner.

We covered the first one hundred meters in 7 seconds (against the wind), the fastest time made so far, and instead of stopping at the usual place we ran right on down to the end of long Sand Point, turned round under our own power and started up the harbor. The wind was now of course behind us.

I was unable to get the speed of rotation although I noted the push which was 100 lbs., whereas in going down the course the push was 135 lbs.

It seemed to me to be in about two seconds time when Mr. Bedwin quietly advised me to “look out”; and then we struck the landing of the motor boat house. We were all three thrown violently forward, and as it afterwards turned out Mr. Curtiss was the only one hurt. He seemed to have struck his lower lip against the steering wheel and a deep cut resulted.

Thefront skate of the ice-boat was completely tornaway and the steering gear badly damaged.

Dr. McIver was brought over from town in our sailing ice-boat, and Mr. Curtiss, having been rushed to the Point, was soon attended to by the Doctor, and by Miss Cadel”.

J.A.D. McC.

The Doctor reports that the injury is not serious and that Mr. Curtiss will be all right in a few days.

A.G.B.

23

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

24

Fig. 6

Fig. 7

Fig. 8

Fig. 9

25

C219

26 27 28

THE DUFAUX ENGINE: By G. H. Curtiss.

Feb. 6, 1909 :—Referring to the article on page 14, Bulletin No.VII, in which Mr. Baldwin points out the advantages of the Dufaux engine I must say, that I do not agree entirely with Mr. Baldwin's views. This engine is constructed in rather a novel manner. The cylinders are set up in tandem, as it were, and there are five of these pairs placed in a vertical position, with the crank-shaft above. Each cylinder is double acting, that is a charge of gas is exploded on both sides of the piston. The action being four-cycle the result is the same as if 20 ordinary four-cycle clyinders were used.

The advantage gained by this double action is questionable as the connecting rod between the two pistons, facing as it does one cylinder to the other, makes a difficult bearing to lubricate and is bound to wear and cause a leak. A very slight leak at this point, where a pressure of several thousand pounds per square inch comes first on one side and then the other, is bound to have a bad effect on the idle cylinder. The advantages of this motor are given as follows:—First, light weight; second, low center of gravity; and third, the crank case. The H.P. given is 120 and the weight 65 kilograms.

This is indeed extremely light but I doubt if it could be verified in a practical test, and as a matter of fact, an extremely light motor is not considered as desirable as one on which absolute dependence may be placed. 29 2 This Dufaux motor, with its automatic valves, complicated lubricating system and extremely light construction might work well in the hand of its builder when new and before it had become worn; but in the hands of the average experimenter it would likely meet with the same fate as the rotating type of engine, which, although it shows up well in an exhibition, refuses to run at all when placed in the hands of the man who must actually do the work.

The low center of gravity is of no advantage in the engine itself, but only in a flying machine. At the date of Mr. Baldwin's article the direct drive was considered desirable. At this time a larger propeller geared down, is considered best; therefore the engine can be placed low in the machine with the propeller shaft above and the low center of gravity accomplished without regard to the position of the engine cylinders. Cylinders in a vertical position combined with a closed crank case are obviously advantageous in connection with the lubrication.

While a forced feed system is most desirable, the splash system, that is, the crank shaft running in oil, makes an auxiliary, and the oiling of the entire engine is assured even though the feed pipes to some of the bearings or the pump which supplies them, is out of order. There is no such thing as too much oil on a high speed bearing.

If the need of an extremely light motor is felt I would advocate the star type, that is an engine with seven or nine cylinders placed in the form of a star around a single 30 3 shaft. Herring's motor, which is claimed to be the lightest in the world, is of this type. It has, however, the same disadvantages in its lubricating system as the Dufaux but has not the sliding connecting rod between the cylinders which, if I am right in my theory, is a most serious fault as the engine would fall off in power very fast with wear, while the ordinary cylinder gains power with use, at least to a certain period.

Everything considered I should advocate the regulation four-cylinder vertical water-cooled engine for all requirements up to 35 H.P. If more than this is desired an 8 cylinder V type would give the best sat ?? is faction.

G.H.C.

31

RECORDING INSTRUMENTS USED ON ICE-BOAT: By J.A.D. McCurdy

Feb. 11, 1909 :—Two instruments were devised to be used on the propeller ice-boat, the readings of which gave us the thrust of the propeller in lbs., and the velocity of the wind in miles per hour relatively to the ice-boat. These instruments are technically known as a dynamometer and anemometer.

Dynamometer :—The construction of the dynamometer is shown in Fig.I. As the propeller revolves producing a thrust of a certain number of lbs., the counter-shaft advances in the direction of the line of thrust compressing the heavy spiral spring.

As the amount of compression of the spiral spring is proportional to the thrust in lbs., a pointer moved by the advancing shaft would record the thrust by indicating on a graduated dial the amount the spring was compressed.

The spring selected would compress one inch for the first 200 lbs. of load applied. This inch of movement was multiplied on our dial, and a graduation of the face was effec ? t ed by equally dividing up the space between the limits of the magnified inch. This graduation was afterwards checked by means of a standard spring balance.

Anemometer :—Fig. 2 shows the method employed in the construction of the anemometer.

The construction of the ordinary anemometer necessitates the counting of the number of turns per minute in order to ascertain the velocity of the wind. What we wanted was an instrument which would indicate at a glance the velocity of 32 2 the wind relatively to the ice-boat.

The air acting on the square foot of rectangular surface at one end of the lever arm, caused a motion of this arm about its pivoted point, and this in turn transmitted the motion to the pointer.

The method of graduation employed was to run the ice-boat at any speed noting the place on the dial to which the pointer moved. The velocity of the wind relatively to the ice-boat was at the same time observed by the rotating type of anemometer, and the point on the dial indicated ? b y the pointer was marked with the miles per hour corresponding to the reading obtained. In this manner, by varying the speeds of the ice-boat, a considerable portion of the dial was graduated.

J.A.D. McC.

Fig. 1.

Fig. 2. J.A.D.M c C. Feb. 11. 09.

34

SELFRIDGE TO THE A.E.A .

To The Aerial Experiment Association, Baddeck, N.S.

San Francisco, Cal., Feb. 2, 1909 :— I am in receipt of your Bulletins Nos. 27,28 and 29.

I can't but feel that your energy and experience will surmount the difficulties that at present seem perplexing.

Mr. Chanute's letter to Mr. Bell is exceedingly gratifying.

(Signed) E. A. Selfridge.

MRS. BELL TO THE A.E.A.

Baddeck, N.S., Feb. 10, 1909:— Mr. Chairman and Associates of the Aerial Experiment Association.

What is the object of a monument to Thomas Selfridge? His Associates of the Aerial Experiment Association will make a special contribution to his memory by the publication of his own article on Aviation, “A Brief Sketch of the Progress of the Art of Aviation”, and in the compilation of his biography.

In the monument for which funds are now being raised by the Aero Club, the world in general is invited to participate, and some of the very first subscriptions have come from across the water.

35

2 Why should people who did not know him put up a monument to Thomas Selfridge?

It is necessary to have a clear conception both of the reason why, and why the popular feeling is justifiable, before proceeding to decide what form it should take and where it should be placed.

The dramatic aspects of the disaster at Fort Meyer where an Army Officer, young, ardent, full of life and the joy of life, who had eagerly volunteered for a dangerous post of duty, and who was supremely happy at having achieved his purpose — was suddenly hurled to death in the sight of thousands, st ? i rred the popular imagination, and the pitifulness of it aroused a sympathy which instructively sought some such expression. But the justification of it lies deeper. Like an electric flash the accident brought into sudden view one whose whole life embodied the highest ideal of soldierly qualities. What one so young could do for his country he had done. It was no accident that had placed him, the youngest officer of his grade, at Wright's side that day. No accident that of all our Army he was the only one who had himself previously driven a flying machine through the air. No accident that the youngest of all the new Aerial Corps of the Signal Service had been selected to command the new Army Balloon in the coming manuoevres.

It was because he, holding that a soldier's duty comprised not the bare measure of usual time and strength, but the very best of himself mentally, morally and physically, 36 3 had carefully studied the needs of the Army and had fitted himself for the call he foresaw was to come.

He is dead, he has paid the uttermost man personally can pay. What we may do to honor his memory cannot affect him, but we his friends who knew him, can endeavor that being dead he shall still speak, that his monument by its silent witness shall testify what he did and strove after, and point out the way that others may follow.

If we do this the place for his monument is not in a cemetery where it is but one among many, like a labelled object in a Museum, nor marking the spot where Wright's machine fell, thus spelling disaster and death, but among the haunts of men where young soldiers do congregate and discuss what each shall dow ?ih do with his life.

Let it be somewhere on the grassplot near the flag staff at Fort Meyer; the Campus or Assembly Hall at West Point. There v b y may other young soldiers like himself be induced to follow where he led and carry forward the work to which he gave his life and for which he laid down his life.

(Signed) Mabel G. Bell.

37

THE OUTLOOK ON AVIATION: By The Asst. Editor.

The Girard Airship has a total weight of 3550 lbs. with 2300 sq. ft. of surface. An interesting feature of the machine is the fact that installed are two entire engine plants rotating four propellers, two in front and two in the rear. These propellers are of model construction in th ? a t their breadth of surface increases towards the axis.

It is easy to see that Russia does not mean to be behind in Aeronautics. She has already set aside $1,000,000 for that purpose according to information received at the War Department.

Both the Senate and House have finally passed the $500,000 appropriation for Aeronautics in this country.

The Gold Medal to be presented by our Government to the Wrights will be the first official recognition the Government has shown.

Wilbur Wright's flights at Pau are well attended. To the present time he has made no long flights. Wright is using a new motor.

An Aeronautical Chair is to be established at the College of France. Reports have it that Wilbur Wright was 38 offered the Chair and has refused.

The most noteworthy and interesting feature of the British Army Aeroplane is the form of propellers. The following is quoted from the Scientific American for Jan. 30, and may be of value to us just now:—

“The most noteable feature of this (The British Army) aeroplane is found in the two propellers. These are of a peculiar type similar to that described in the Supplement of Dec. 19, 1908, by Mr. Sidney H. Hollands.

The peculiar feature is, that the blades are broader at their base than at their ends, the width at the base being 24 inches, and the width at the outer end being but five inches.

The length of the blades is about 3 feet. They are made of aluminium and are curved somewhat like a sugar scoop. Each one is mounted on a strong piece of steel tubing.

Mr. Cody, as well as Mr. Hollands both claim to have found that a blade of this shape gives better results than the usual form of blade, which is narrower at the base than at the tip. It is only in this respect that Mr. Holland's propeller resembles that used by Mr. Cody on the British Army aeroplane.

In a letter to English "Aeronautics" Mr. Hollands describes his propeller (with which he claims to have obtained a thrust of 26 lbs. per horse-power) as having two 'narrow-tipped blades of a special conchoidal (or irregular crescent-shape) cross-section, set to pitch-angles of maximum efficiency. These angles, together with the other foregoing essential features, were all separately determined by a long and careful series of comparative experiments. The blades have a twist, and the pitch is 0.7 of the diameter. It is most efficient at high speeds (the driving torque being relatively very small), and the essential features of the design lend themselves to strength and rigidity. It is constructed wholly of high-grade steel, and the two meters diameter type weighs 13 lbs., with a factor of safety 39 of six, at 1200 revolutions per minute'.

Mr. Hollands claims that his propeller is superior to those used on the Army Aeroplane, and that it was designed some years before the propellers of Mr. Cody.

According to a cable report, the first test of the remodeled aeroplane occurred on the 20th instant. Two short flights were made by Capt. Cody successfully, but the third one was terminated, after the ma ? c hine had traveled some 300 feet at a height of about 20 feet from the ground, by the buckling of the horizontal rudder, and the aeroplane fell heavily and was badly wrecked".

EXTRACTS FROM L'AEROPHILE FOR JANUARY 15, 1909 (Translated) By Miss Mabel B. Mc Curdy .

The Wrights at Pau :— Before beginning his flights at Pau, Wright weighed his machine and found it to be 364 kilos. Wright himself weighs 71 kilos, having gained 8 kilos during his stay at Le Mans. All the Wright material has been shipped to Pau, where the Conpte d'Aviation and the Aero Club at Bearn have finished the construction of the aerodrome shed which is in the vicinity of Pont-Long. The shed is a splendid big building with ample room for sleeping quarters as well as storage room for the aeroplane.

Orville and Miss Katherine Wright have accompanied Wilbur Wright to Pau where he, Wilbur, will continue his flights, and also teach his new pupil, M. Paul Tissandier, to fly.

Wilbur Wright will return in March to America to terminate the military experiments with the Wright Aeroplane which were interrupted by the accident at Fort Meyer, unless 40 Orville will be in a condition to continue them himself.

The two aviators will determine, in the meantime, questions relating to the selling of their invention in France and in Europe.

Even at this stage of the game the Petites Affiches, a French Newspaper, has published an advise of which the principal extracts are:—

“The Society has for its object, in all countries, the buying, selling, the manufacture, and the trade of all kinds of aeronautical machines; also all parts necessary for the construction of these machines, the receiving, the buying, and the selling of all patents or licences concerning the industry:

First, the ownership of 3 Wright French Patents: No. 342,188, on the 22nd of March 1904; No. 384,124 and No.384,125 on the 18th of Nov. 1907. All these were for ‘the perfection of aeronautical machines”:

Second, The Wright to the ownership of all other French Patents by request on the part of the Wrights;

Third, tables and formulas used in construction of the machine employed by Mr. Wilbur Wright in France. Mr. Wilbur Wright has promised, furthermore, to give immediately after the organization of the present Society to three persons already designated, instruction for mounting and dismounting and operating the machine. He promises, besides to personally give to the present Society his help until these three people are in a condition to repair and operate the aeroplane;

Besides, Mr. Wilbur Wright, in his own name, and in the name of Mr. Orville Wright, and M. Lazare Weiller, conveys to the Society the right to use the machine which was used in the epxeriments of Mr. Wilbur Wright".

41

Henri Farman's Aeroplane: — Entered for the Michelin Cup, on the 31st of Dec. 1908, Henrl Farman, at the camp of Chalons, on account of the cold weather was able to make only a few flights of 1000 to 1500 meters.

It is said that the celebrated aviator has sold his machine in the form of a triplane to a sportsman who just now does not desire to be known.

Farman, j h ereafter, will set about constructing, at Chalo ? n s, some machines after his own ideas and improved by means of his past experience. The first machine will be a triplane lighter than the one which he has just sold, fitted with a motor of 25–30 H.P. placed in such a way as to be able to rotate either one or both propellers.

The Ant i o inette V Aeroplane:— On the 20th of Dec. the Antoinette monoplane, operated by M. Welferinger, crossed and recrossed many times the field at Issy at a height of 8 meters. On the 25th he accomplished a very pretty flight of one kilometer at the speed of 75 kilometers per hour.

On the 5th of Jan. 1909, in spite of his small area of surface he carried aloft a passenger, Mr. Robert Gastambide and carried him a distance of 400 or 500 meters. On the 6th of

Jan. a series of very successful flights were made at a speed of 75 ? k ilometers per hour. In the last flight being a short one, a wing struck the ground but was repaired the same day.

The new Biplane "Rene-Gasnier ":— M. Rene-Gasnier re-built the biplane with which he had already made some fine 42 flights, but he modified it by reducing the angle of the main planes and by lengthening the lower plane with the addition of two balancing wing tips.

Surface:— 35 sq. m; breadth: 10 m; length from the extremity of the front control to the extremity of the rear stablizing tail, 9 m 50; weight, mounted and ready f ? o r flight (Gasoline, oil and water for two hours); 500 kilog. Motor 50 H.P. Antoinette.

Robart Aeropane :—Experimented on the 21st of Dec. at Amiens, on the Croix-Rompue grounds. The Robart aeroplane, after making two starts, left the ground for a flight of 10 meters. The turf was very bad and the wheels made a continuous drag on the ground. The aviator has decided to experiment again after the ground has been rolled.

Moore,—Brabazon Aeroplane :— Regu a l arly entered for the Michelin Cup, M. Moore-Brabazon prepared to try his luck at Chalons on the 31st of Dec. when the gasoline tank exploded wounding the machinist.

Folding Plane :— A model of a plane, without motor able to be folded to facilitate transportation, has just been invented by M. Scrive. Set up it measured 8 m 50 in breadth 7 m in length and weighs 26 kilos, and can support a man of 70 to 80 kgs. Folded it displaces an area of 2 m 60 in height; 1 m 35 in width; and 2m 50 in length.

G.H.B.

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXXIII Issued MONDAY, FEB. 22, 190 ? 9

ASSOCIATION'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell Assistant Editor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO. XXXIII ISSUED MONDAY FEB. 22, 1909 .

Beinn Bhreagh, Near Baddeck, Nova Scotia .

TABLE OF CONTENTS.

1

EDITORIAL NOTES AND COMMENTS .

Langley Medal .

Feb. 17, 1909 :— At a meeting of the Board of Regents of the Smithsonian Institution held Feb. 10, 1909, the following resolution, proposed by Senator Cabot Lodge was adopted:—

RESOLVED: "That the Langley Medal be awarded to Wilbur and Orville Wright for advancing the science of Aerodromics in its application to Aviation by their successful investigations and demonstrations of the practicability of mechanical flight by man".

It was the sense of the Board that two medals should be struck off, one for each of the Brothers, and that each medal should bear both names. A.G.B.

Baldwin's Lecture .

Feb. 18, 1909: — Mr. and Mrs. F.W. Baldwin left Beinn Bhreagh this afternoon for New York. Mr. Baldwin proposes to spend a day or two in New York at the Automobile and Motor Boat Show, and will then proceed to St. Catherines Ont. where he will lecture Feb. 25, before some private Club or Society with which he is connected. On Feb. 27, he will deliver, at the University of Toronto, a lecture on Aviation, a copy of which appears in this Bulletin. He will return to Beinn Bhreagh from Toronto via Montreal and Quebec. A.G.B.

2

Mauro, Cameron, Lewis & Massie to Bell .

To A. G. Bell, Baddeck, N.S.

Washington, D.C., Feb. 11, 1909 :— Complying with the directions contained in yours of the 2d inst., Mr. Cameron has had a consultation with Mr. C. J. Bell in regard to the question as to whether there should be a joint application in the names of all the members of the Aerial Experiment Association including Lieut. Selfridge, or make two applications, one in the name of Mr. F. W. Baldwin alone, and the other a joint application. Mr. Bell coincides with the view held by Mr. Cameron, that there should be two applications.

Since Mr. Baldwin alone contributed the subject-matter of claims 1 to 11, and 13 to 16 inclusive, he is unquestionably the sole inventor thereof, and as this matter is clearly and easily segregable from the subject-matter of the other claims, the patent would unquestionably be stronger as a sole patent than it would be if included in the joint application.

Mr. Cameron has carefully considered your suggestions dated January 25th, 1909.

Concavo-convex in a lateral direction . We do not think that it would be wise to insert in the claims the limitation “in the lateral direction”. We think it would be better to place in the body of the specification say after the word “employed” in the last line of page 3, something like the following:—

3

2 “In some instances, this concavo- convex form may be such that the supporting surfaces will be curved toward each other in a fore and aft direction, the upper surface having its upper side and the lower surface its lower side convex in a fore and aft direction. Preferably, however, the upper surface has its upper side convex and the lower surface its lower side convex in a direction from side to side, while said surfaces are approximately parallel along the lines where they would be cut by any ver ?? ti cal fore and aft plane”.

With such a statement in the body of the specification it would be made clear that the inventor contemplated as an expression of his inventive idea the concavo-convex supporting surfaces, whether the concavity extended in a lateral or a fore and aft direction, and the expression of the claims, such for example as claim I, is broad enough to include either of these forms. We think that your suggestion and discussion of this matter will thus have enabled us to materially broaden the specification.

Specification, page 15, line 3 . Your criticism as to the “sole” function at this point is quite correct, and the word “sole” was left in from the old specification by an oversight.

Mr. Baldwin's suggestion for a broader claim than present claim 13 is a good one, though we fear that the claim is so broad that we will have difficulty in obtaining it. Nevertheless, we will make the effort.

Claim 14 . The suggested correction to this claim is a good one, and will be made.

4

3 Claim 20 . We do not think your first criticism of this claim is well founded. It simply amounts to a statement of the fact that there may be other rudders on horizontal axes than the ones you employ. Nevertheless, your rudders do turn on approximately horizontal

axes, as shown in the drawings. Possibly we might adopt Mr. McCurdy's suggestion and insert the word “approximately” before “horizontal”, though beyond all question, the claims would be so construed any way.

Generally speaking, and in its normal operation, the machine as a whole is intended to be approximately horizontal. Whether the machine is moving straight forward or whether it is rising, or whether it is descending, the medial line extending from side to side of the machine would be approximately horizontal, and in fact, the aim would be to so maintain it at all times. In any event, when the machine is stand-on the ground preparatory to a flight, it is undoubtedly the intention to have the medial line of the machine extending from side to side horizontal, and in this case the axes of the balancing rudders are approximately horizontal, as shown in the drawings.

Replying to the suggestion contained in the last paragraph of page 4, we feel that if claim 20 were amended as suggested, it would be responded to by a vertical rudder, since the axis of the vertical ruuder would be vertical, and such axis would be “at right angles to the said fore and aft medial line of the structure, and substantially radial thereto”.

5

4 But this is old. Certainly it is old to have one rudder mounted on such an axis, though it may be new to have one on each side of the fore and aft medial line of the structure.

Referring to the first paragraph at the top of page 5 of your suggestions, the writer certainly had not grasped the idea that,

“The essential idea involved is that the axis should be at right angles to the medial line of the structure and substantially radial thereto”. (meaning the axes of the balancing rudders).

We should regard it as exceedingly dangerous to make any such statement, either in the specifi f c ation or in any part of the record of the application, because this would be responded to by a vertical ru ? d der. To place a rudder above the machine with its axis vertical and its surface vertical would appear to be merely to place the steering rudder above the machine rather than to the rear of the machine, as heretofore.

Claim 31 . This claim can be easily changed to avoid the criticism you suggest, by using the word “member” instead of “part”.

Claims 34 and 36 . Mr. McCurdy's criticisms of these claims are sound, and they will be changed accordingly.

Claim 42 . We think that this claim should be included in Mr. Baldwin's sole application. Read this claim in connection with claim 11, and it will be seem that it is but a broad and less specific statement of the structure defined in claim 11.

6

As soon as we receive your instructions as to whether you wish one or two applications prepared, we can speedily forward either the single or two applications for execution, as you may direct.

(Signed) Mauro, Cameron, Lewis & Massie.

Bell to Mauro, Cameron, Lewis & Massie.

To Mauro, Cameron, Lewis & Massie, 620 F Street, N. W., Washington, D. C.

Feb. 17, 1909 :— Please go ahead with two applications as suggested.

(Signed) Graham Bell.

7

SELFRIDGE MEMORIAL TABLET .

A Letter from Mrs. Bell to Mr. Curtiss.

Beinn Bhreagh, Feb. 13, 1909 :— What I have had in mind all along for the Selfridge Memorial is something like the bronze bas-relief by St. Gaudens to Capt. Ellsworth and his first regiment of colored troops. It is let into the tall iron railings that separate Boston Common from the State Capitol.

I have hestitated to mention this, fearing that the funds in Lieut. Lahm's hands would not admit of anything so ambitious.

But when one comes to think of it the memorial would be not simply to Thomas Selfridge personally, but to him as marking a very great and stupendous historical event — the advent of the American Army on an entirely new sphere of action. It marks one of the greatest, if not the greatest, epoch in our Army; and looked at in this light it is certainly as well worthy of adequate commemoration as the enrollment of the first regiment of colored troops o i n the Army.

(Signed) Mabel G. Bell.

8

AVIATION:— By F. W. Baldwin.

(A Lecture to be delivered by Mr. Baldwin at the University of Toronto, February 27, 1909).

It is a matter of encouragement to the Art of Aviation and the cause of Aviation in Canada, that a great Canadian University should be giving some thought to the subject of flying-machines.

Only a few years ago intelligent people scoffed at the idea of flying, and a man needed a good deal of courage to profress his faith in its ultimate accomplishment. Repeated failures had given rise to most unreasonable prejudice. Sweeping criticisms had put the problem in a class with perpetual motion. Scientific men felt that it was an unsafe field in which to risk their reputations, and a popular feeling existed that flight involved some inherent impossibility and was in general a subject to be avoided.

It is difficult to realize how quickly all this has changed, but it is easy to see why it has changed. Flight has actually been accomplished. Machines a thousand times heavier than the air in which they are supported make long and success g f ul voyages. The practicability of flight has been splendidly demonstrated. The world is at last convinced that flying is a reality.

Wilbur Wright, the American Aviator, on the 31st of Dec. 1908, remained in the air for two hours and 18 minutes and covered an official distance of 76 ½ miles.

9

During this flight which is a record one for heavier-than-air machines, he showed clearly that he had perfect control and could steer up and down or make turns with the greatest ease.

Even more striking than this, though vastly easier of accomplishment, was the cross-country flight of Henri Farman on Oct. 30, 1908. He flew from Chalons to Rheims a distance of 17 miles in 20 minutes. The next day Louis Bleriot in a heavier-than-air machine of a different type, flew from Toury to Artenay over fences and houses and back again to the starting point. His average speed for this remarkable performance was 53 ½ miles per hour.

Does it need more than this to convince the most skeptical that the development of the flying-machine marks a new era in the progress of the world.

It must be remembered that these are only experimental machines. Their commercial value is doubtful at present, but the speed at which they start is surely significant of what the near future may bring forth.

The first locomotive startled the world by traveling about 10 miles an hour, yet the aerodrome begins its career where the locomotive is to-day.

Perhaps it is not quite fair to say begins its career. Strictly speaking the flying-machine began its career long before it was able to fly, and a brief history of its early development is necessary in order to appreciate the long and tedious struggle of the mechanical fledgling before its wings 10 and muscles were strong enough to support it.

We may pass without comment over the well worn legends which go back to mythology. These tales are but traditions which show how from time immemorial man has longed to fly.

The first authentic record dates back to Leonardo da Vinci. About 1492 he prepared a treatise on the flight of birds which showed that he was a careful observer and gave more than a passing thought to the subject. The earliest technical designs we have for an apparatus to serve for personal flight I found among his notes made about 1500. His plan for wings is interesting inasmuch as he did not attempt simply to attach flaps to a man's arms. He realized from his study of Anatomy that the muscles of the arm were not suited for this purpose, and proposed to use the operator's legs for the down stroke of the wings. No experiments are recorded and it is doubtful if his apparatus was ever tried.

From this time on there were many attempts to imitate the flight of birds, and investigations were made from time to time by scientific men. Still nothing of importance was done until in about the year 1665 the Royal Society of Great Britain made experiments on the resistance a plane surface met with in falling, and the time it took to drop, if at the same time given a motion of translation. Sir Robert Hooke the great experimental physicist clearly appreciated that when moving, a plane surface met with greatly increased resistance to dropping and conversely if driven forward could be made to support itself. The results of these investigations 11 seem to have been lost and with them some designs relating to flying which Sir Christopher Wren made and promised to submit to the Royal Society.

While these experiments at once suggested to us the aeroplane principle of flight, it is doubtful if the men of this time had in mind anything but wing-flapping devices. These were more or less hopeless without the aid of mechanical power and the theory was prevalent that man was not ordained by God to fly. As broken bones invariably accompanied these heavenward aspirations, there was abundant proof that this view was correct.

But while the superstition of the time did much to retard progress, by far the greatest setback Aviation received was the invention of the balloon in 1783 by the Montgolfier Brothers. This statement may seem paradoxical but nevertheless it is true. Public Attention was diverted from the efforts of the old school who still pinned their faith on heavier-than-air flight. The struggle to compete with the birds was given up until 1842. In this year Henson created a stir by patenting a machine which was in every way remarkable. It really looked as though it would fly, and the greatest interest was taken in his experiments.

Here we have the first attempt to imitate the soaring bird instead of the flapping bird, and this in itself was a big step in the right direction.

Henson's idea was to obtain support from a large aeroplane propelled by two aerial propellers of large diameter resembling small wind-mills. The power was to be supplied by 12 a 30 horse-power steam engine.

While clumsy and unwie ?? ld y the design was a masterful conception of the successful machine of to-day. It did not fly, not so much because his reasoning was in error, but because he did not have the instrumentalities to work with. The steam engine of that day was far too heavy for the p ? u rpose. The form and construction of his supporting surfaces may have been crude, but looking back at his plans in the light of recent successes, it is perhaps the most remarkable machine ever contemplated, and shows a wonderful anticipation of the modern aerodrome. Had this genius been the possessor of the light and efficient motor of the present day, it is altogether likely that his large machine would have flown as his models did.

Henson and his friends were so sanguine of success that a large Company was formed known as the Aerial Transit Company. Their visions of crossing the Atlantic and the Sahara etc. were unfortunately never realized, and public attention turned once more to the less promising but easier solution of the matter — the balloon. So that for the next few years what is know as the lighter-than-air school held uninterrupted sway until in 1863 a Frenchman, Nadar, published his now famous manifesto upon Aerial Automotion. It appeared in all the newspapers of Europe and reawakened interest and promoted discussion.

In the most eloquent and dramatic style Nadar expressed the opinion that the chief obstruction in the way of navigating the air was the attention which had been given 13 to balloons, and that in order to fly it was necessary to follow the laws of nature and to adhere to nature's plan — the bird — which is heavier than air.

His arguments were weakened by some too sweeping deductions, but nevertheless his dramatic appeal to men of science stimulated what may fairly be called the renaissance of the heavier-than-air school.

Three years later Francis Herbert Wenham read a very able paper on the subject of man-flight before the first meeting of the Aeronautical Society of Great Britain. After studying the flight of a flock of birds he came to the conclusion that the lifting effect of a large sustaining surface could be most economically obtained by arranging a number of small surfaces above each other in tiers. In 1866 he built a most ingenious glider upon this principle, and while his machine did not glide satisfactorily his happy idea of superposing surfaces was later taken advantage of, and he will always be remembered as a man who lived a long way ahead of his time.

Hopeless as seemed the struggle of these early pioneers their efforts effectually paved the way for the two great men who were simultaneously to demonstrate the feasibility of flight.

Otto Lilienthal, A German Engineer of great originality, and Sir Hiram Maxim attacked the problem in 1892 from ent ? i rely different sides. Both achieved success, which inspired others to take up the work, and the world was given two distinct lines of reasoning (each amply verified by experiment) 14 which showed that heavier than air flight was within man's reach at that time.

Otto Lilienthal was born May 24, 1849 at Anklam, Pomerania. From his boyhood he was much interested in manflight, and when only 13 years old began practical experiments with his brother Gustavus. Their first wings consisted of light flaps fastened to the arms. Being naturally enough afraid of the ridicule of their school fellows they made their experiments by night. Unsuccessful was were all their efforts to get started by running down hill, the ambition to fly never left Otto Lilienthal, and later when at College he took up the work again making careful measurements of the supporting power and resistance of birds' wings. In 1891 he built an apparatus later to be known as a glider.

It consisted of a large sustaining surface of about 150 sq. ft. arched in form like a huge wing. With this he made thousands of gliding descents, and became very expert in balancing his machine in the air.

He believed that the art of balancing in the wind must first be learned in this practical way, and showed first, that properly curved surfaces were much more efficient than flat ones, and second, that success was more likely to be obtained by first developing an efficient glider, and then applying power to it, than by attempting to build a complete power-driven machine as Maxim did.

Lilienthal met his death while experimenting with his glider in August 1896. Some claim that a guy wire which supported his wings gave way. Others that a gust of wind 15 upset him, but however it happened this deplorable accident removed the man who did most to demonstrate that human flight was possible, who was the first in modern times to imitate the soaring birds with full-sized apparatus, and who was so well equipped in every way that he undoubtedly would have achieved final success had he lived.

Lilienthal?success was largely due to his novel attitude toward the problem and his exceptional ability to look upon the flight of birds from a true engineering standpoint.

The only research of this time in Aviation which stands comparison with Lilienthal's is that of Sir Hiram Maxim. He became interested in Aerial Locomotion as a mechanical problem and concluded that a balloon by its very nature was light and fragile — a mere bubble. He argued that even if it were possible to construct a motor to develop a hundred horse-power for every pound weight, it would still be impossible to navigate a balloon against a wind of more than a certain strength. The mere energy of the motor would crush the gas-bag against the pressure of the wind, deform it and so render it unmanageable.

Sir Hiram Maxim however, was not simply a destructive critic, and in condemning the balloon he was ready with a substitute. Like Nadar he believed that inasmuch as all things that fly are heavier than the air the problem must be solved by a machine which has a natural tendency to fall, and is only supported by the dynamic resistance of the air.

16

The principle upon which all heavier-than-air machines depend is that of a kite.

A kite as every schoolboy knows is supported by the wind while being held against it by a string. If there is no wind it can still be kept aloft by ru ? n ning with it because in this way an artificial wind is created.

Now the motor-driven machine is like the kite that is kept up by running, the running boy with his string being replaced by the motor and propellers which by driving it rapidly forward make the artificial supporting wind.

After carefully studying the power necessary to drive a large aeroplane through the air and the lift which would result from it, Maxim constructed what was practically a large power-driven kite. The steam engine which drove the propellers was one of the most interesting features of the whole apparatus, and as a marvel of lightness and power is still unsurpassed. The two screw propellers were 17 ft. 10 inches in diameter and under the full 300 horse-power of the engine exerted a steady push of over 2000 lbs.

The completed machine weighed about 8000 lbs. and had a supporting surface of approximately 4000 sq. ft. It was mounted on wheels which ran on two rails and had another set of rails arranged above to restrain the machine if it should lift from the track. The first trial of the machine was made some time in 1892. When released the flying-machine darted forward quickly acquiring the speed of an express train. At a speed of 36 miles an hour the wheels left the 17 track; and, for the first time in the history of the world a heavier-than-air machine actually left the ground fully equipped with its own motive power and a crew of men.

The first great obstacle was thus overcome. Our fledgling had fluttered successfully. It was possible to make a machine light and efficient enough to support itself.

Control of it however was a very different matter, and Maxim's arrangement was not promising in this respect. It was woefully deficient in stability, and Sir Hiram did not attemp ? t a free flight with his apparatus.

The wisdom of Lilienthal's plan now became still more obvious. It was one thing to build a machine with the requisite power to launch itself into the air, but quite another problem to keep it there. Safety is the all important necessity. A machine must be stable enough to give men an opportunity to become skilled in its management in the air. Practice alone can do this. It would take a man a long time to learn to row for example in a boat which upset at the first stroke of the oars. Since Maxim's experiment in 1892 the struggle has been for control and stability and the importance of Lilienthal's practical method of experiment was more than ever appre ic ci ated. Lieut. Pilcher, a talented young naval officer, realized this and took up Lilienthal's work in England. Also Mr. Octave Chanute the well known civil engineer began gliding experiments in America.

Pilcher met the same fate as Lilienthal before he arrived at the stage of installing a motor, but Dr. Chanute was successful in obtaining most useful information without 18 an accident of any kind. He established a camp near Chicago on the shore of Lake Michigan where slopes suitable for gliding could be found. He and his assistants first built a glider similar to Lilienthal's but soon discarded it in favor of a much more stable and efficient truss form which has since become generally known as the Chanute type. The name of Lawrence Hargrave of Australia might also be associated with the development of the Chanute type as the basis of the double-decked Chanute Glider is really a Hargrave Box Kite.

Dr. Chanute gave to the world practical working data from which it was possible to build a successful power-driven machine. Still more than this by his kindly interest and generous advise he encouraged and directed the efforts of a younger generation some of whom were later to fulfil his most cherished hopes, the notable of these being the Wrights.

While Dr. Chanute was making his field experiments another man in America was laying the foundation of a new science. Prof. Langley, late Secretary of the Smithsonian Institution undertook to build a machine for the U.S. War Department. Previous to this he had made exhaustive laboratory experiments which established heavier-than-air flight as an exact science. To this he gave the name of Aerodromics from the Greek verb — aerodromeo — meaning to traverse air — to run in the air.

19

The most startling fact which he communicated to the world is now famous as “Langely's Law”. In his book entitled “Experiments in Aerodynamics” published 1891 he says:—

“These new experiments and theory also when reviewed in their light show that if, in such aerial motion, there be given a plane of fixed size and weight inclined at such an angle and moved forward at such a speed, that it shall be sustained in horizontal flight. Then the more rapid the motion is, the less will be the power required to support and advance it.

This statement may seem so paradoxical that you may well wonder if you have rightfully understood it. To make the meaning quite clear let me repeat it in another form and say that these experiments show that a definite amount of power so expended at any constant rate will attain more economical results at high speeds than at low i.e., one horse-power thus employed will transport a larger weight at 20 miles an hour than at 10, a still larger at 40 miles than at 20, and so on with an increasing economy of power with each higher speed up to some remote limit not yet attained by experiment but probably represented by higher speeds than as yet have been reached in any other mode of transport”.

In 1896 Prof. Langley obtained excellent results from a large model driven by an extremely light gasoline motor and proceeded to reproduce it on a scale large enough to carry a man. The mechanical difficulties involved in this apparently simple plan cannot be appreciated by one who has not attempted to do it.

However, the combination of Mr. Langley's perseverance and the engineering skill of Mr. Char e l es Manley, his able assistant, was not to be denied and in 1903 the full-sized machine was ready for trial. The quarter sized models had been successfully launched by a catapult apparatus which 20 gave them the necessary initial velocity by literally throwing them into the air.

The plan was obviously a difficult one to adopt on the full-sized machine which weighed over 800 lbs., but Prof. Langley would not depart from his former plan and her it was that Prof. Langley's practical sense failed.

On both occasions on which a launching was attempted the aerodrome caught on the launching ways and was precipitated into the water. While uninjured by the plunge the machine was partially wrecked by the over zealous efforts of a tug-boat's crew to rescue it and although repaired was never again given another trial.

To the public Langley's aerodrome, nicknamed the “buzzard” was an absolute failure, but the truth of the matter is that it was never tried. The launching apparatus, it is true, did fail but not the aerodrome as this was never launched.

The difficulty Langley met with in increasing the dimensions of his successful model without sacrificing either lightness or strength revived an old argument against heavier-than-air flight.

As early as 1872 Helmholtz showed that, while a small model of a heavier-than-air machine might easily be made it was much more difficult to build a large one.

This view was generally accepted by scientific men but in 1891 Prof. Simon Newcomb in an article entitled “Is the Airship Coming” went so far as to say that,

21

“The construction of an aerial vehicle which could carry even a single man requires the discovery of some new metal or some new force”.

He pointed out that as the scale of the dimensions was increased the volume and hence the weight increased more rapidly than did the sustaining surfaces. To illustrate this important point consider a specific example.

Suppose a machine weighs one lb. and has a sustaining surface of one sq. ft. Now consider what happens when the dimensions are doubled. The length of the surface and the breadth of the surface both being doubled will give an area not twice but four times as great which would be four sq. ft. The weight however, depends upon all three dimensions, length, breadth, and thickness. If all these be doubled, as they are to increase the scale, the resultant weight will be eight times that of the half-sized model or 8 lbs. Thus the machine on the large scale, while it will have four times the surface of the smaller one, will weigh eight times as much.

The line of reasoning holds for similar designs in which the dimensions only are increased but it has been cleverly by a system known as unit construction.

Dr. Alexander Graham Bell brought out this important principle and developed a unit system which is now well known as tetrahedral construction.

In this unique construction the law of the squares and cubes does not apply as an increase in weight simply increases the number of unit surfaces employed so that the 22 weight must necessarily increase in the same proportion as does the surface. This principle is most important. Interpreted another way it means that an indefinitely large machine will fly equally as well as a small one provided the loads are properly distributed. Each unit cell in this system offers a certain resistance and carries a proportional load; so that if it is possible to make say 1000 of these units carry up a man and an engine it is possible to make 100,000 of them combined in one carry up a hundred men and a hundred engines always provided the men and the engines are not concentrated. Instead of attempting to increase the size of an artificial bird Dr. Bell proposes to combine a flock of artificial birds.

Recent progress in Aviation has been so rapid, and so many have been partially or wholly successful that it is impossible to do more than refer to ? s ome of the most notable achievements.

Orville and Wilbur Wright began gliding experiments in 1902 along the general lines laid down by Dr. Chanute. However they quickly developed original features and in their more mechanical principle of control made a great improvement.

Lilienthal, in his gliding experiments, had maintained equilibrium by shifting the weight of his body. In an unsteady wind this method required a considerable amount of gy ? m nastic skill.

The Wright Brothersadopted the principle suggested by Dr. Chanute of keeping the center of gravity fixed and maintaining equilibrium by changing the angle which their 23 surfaces presented to the wind. The advantage of this system was immediately apparent. By it control was rendered much more certain and the manipulation more rapid.

The Wright Brothers worked persistently on their gliding experiments for three years and in 1905 felt themselves in a position to use power. How well they succeeded everybody knows. When their achievements were first made public many people discredited them because they chose to keep their hard earned to themselves.

In March 1906 the Aero Club of America Officially announced that the Wright Brothers had positively done what no other human being had ever before accomplished. On Sept. 26, 1905, they had flown a distance of 11 # miles and on Oct. 5, 1905 they made a magnificent flight of 24 miles and came down only because of lack of fuel.

The Wright's motor-driven machine in 1905 we now know was made on exactly the same lines as their gliders. It weighed about 925 lbs. including the operator and was so strongly built that it was able to make landing at high speed without being strained or broken. Their object was to develop a machine of practical utility rather than a useless and extravagent toy.

While the Wright Brothers were practical enough to build their own machine, including the motor, they were scientific enough to make Laboratory experiments and to this rare ability to combine theory and practice they undoubtedly owe their success.

24

They realized from the first the intricate nature of the problem. In discussing their own work they aptly remarked that the best dividends on the labor invested invariably came from seeking more knowledge rather than more power.

While the results obtained by the Wright Brothers were more or less doubted in Europe, France began to take a great interest in the subject. Public spirited men offered prizes for heavier-than-air competition and the French Government encouraged inventors in a practical way.

Santos Dumont, already famous for his dirigible balloon was the first to respond.

He succeeded in making the first official free flight in a double-decked machine of rather clumsy design on the 21st of October 1906. The greatest enthusiasm was aroused by his success and more than fifty machines were built as a direct result of Santos Dumont's achievements. France immediately jumped into the lead and is still far ahead. While it is true that the United States have produced the greatest aviators, France builds ten machines to any other country's one.

In Oct. 1907 Dr. Alexander Graham Bell organized an Association to be known as the Aerial Experiment Association. The Association consisted of five members and had as its object the building and improvement of heavier-than-air machine ? s .

Experiments were first made with a large tetrahedral kite at Dr. Bell's Summer Home in Nova Scotia. The late 25 Lieut. Selfridge went up in this man-lifting kite and it was hoped to get data as to the lift and what is technically called drift or resistance with a view to installing a motor and propellers to convert the kite into a free flying machine. The flight was entirely satisfactory but unfortunately the kite was wrecked by being pulled through the water after it had come down.

The Association then moved its headquarters to the engine works of Mr. G.H. Curtiss who was Executive head of the Association. Gliding experiments were commenced. For these gliding experiments the Association adopted the Chanute type, and obtained some useful information from it before building their first motor-driven machine. Selfridge's “Red Wing”, as this machine was called (because the surfaces were wing-like and covered with red silk) was a distinct departu ? r e from the flat Chanute type.

The main supporting surfaces were bowed toward each other at the extremities and tapered from fore to aft like a bird's wing.

The machine was fitted with runners and tried on the ice of Lake Keuka. Although it was hardly expected that it would fly on first trial the machine left the ice after traveling about 200 ft. and made a very promising flight of 319 ft. The machine came down owing to the failure of a single surface tail but did it so gently that it was impossible to tell just when the runner struck the ice. This was the first public flight of a heavier-than-air machine in America and was a matter of great encouragement to the Aerial 26 Experiment Association. Upon a second trial, in attempting to fly her in windy weather the “Red Wing” was badly wrecked and the “White Wing” succeeded it.

The “White Wing” was an improvement on the “Red Wing” in having balancing rudders but she also was rather badly smashed and the Curtiss “June Bug” as the third machine was called, was really the first aerodrome built by the Association which made satisfactory flights.

Altogether this machine has made over a hundred flights varying in length from long jumps to sustained flights of 2 ½ miles. On July 4th, 1908 she won the Scientific American Trophy for the first heavier-than-air machine to fly a kilometer (under test conditions).

Although the “June Bug” was still in commission the Association built a new machine, McCurdy's “Silver-Dart” which is equipped with a powerful water-cooled motor. The “Silver-Dart” made a flight of over a mile in Hammondsport, N.Y., and is now being used over the ice at Baddeck, Nova Scotia.

While it is absolutely impossible to get anything like an adequate idea of a flying-machine without seeing it, perhaps a few illustrations may give some impression of what an aerodrome looks like under way.

(Lantern Slides).

27

Few people realize what an important part sport is likely to play in the development of the practical flying-machine. Motor-car racing is directly responsible for the development of the light engine which makes flight possible, yet the men who raced motor-cars had no idea of developing the flying-machine. They raced for the pure joy of racing. These same men are already taking up the aerodrome, and the most useful lessons will undoubtedly be learned from the extreme racing machines in which comfort, and stability, if need be, are sacrificed to speed.

What form the passenger aerodrome of the future will take, and what it will be used for, no man can possibly foretell, but in view of the present possibilities how long are regions, heretofore inaccessible likely to remain unexplored?

Such places as Thibet and the heat of Africa, for example, have so far resisted civilization, not because white men couldn't live there but because they couldn't get there.

In the history of the world roads have hitherto gone hand in hand with civilization, and it is important for us to realize that the great universal highway above us is now open.

But while the flying-machine may cut down distances, and be of great value as a means of communication there is another significance which, though not nearly so broad as the spread of civilization, comes home to us more forcibly. The big European Powers are spending vast sums of money annually upon aeronautics not as a missionary enterprise, nor 28 in the interest of a sport.

France and Germany in particular, are alive to the fact that flying-machines may revolutionize the art of war. The struggle of fo r the supremacy of the air has commenced in earnest. In this struggle the British Empire has a great deal at stake. England's insular security is threatened. The sea is no longer a barrier. Even in the present state of the Art a dirigible balloon like Count von Zeppelin's is a greater menace to London than two German Navies.

An impression seems to exist that a general agreement was made at the Hague Conference that explosives should not be dropped from dirigible balloons and flying-machines. As a matter of fact this proposal was made, but only one first class power agreed to it.

Mili a t ary authorities agree that flying-machines or dirigible balloons could operate in almost perfect safety at the comparatively low altitude of a mile above the ground and from this height could drop explosives with great accuracy.

If this be the case, London could be destroyed and the combined navies of the world could not prevent it. A military training is hardly necessary to see that our bulwarks must be extended upwards, and our aerial fleet maintained at least upon a two power basis. A great sea-faring people should never be content to see other nations control the sea above us.

However apart from this use in warfare, flying-machines will be of inestimable value for scouting. Major Squier 29 of the U.S. Signal Corps has drawn attention to this fact and pointed out two striking examples which illustrate how flying-machines will be used as the eyes of the Army.

If the United States Army or Navy had possessed a dirigible balloon or a flying-machine during the Spanish-American War the whereabouts of Cevera's fleet would quickly have been discovred.

The other example is still more striking:— The Japanese attack on 203 Meter Hill was one of the bloodiest contests the world has ever seen yet the sole object of this great slaughter was to place two or three men at its summit to direct the fire of the Japanese siege guns upon the Russian fleet in the harbor of Port Arthur.

The usefulness of flying-machines in war ensures the continuous development of the Art of Aviation. The great military powers are afraid of the flying-machine, and the struggle to improve it must therefore go on. Self-protection demands more practical, more air-worthy and more efficient machines.

Flight has been accomplished. The flying-machine is actually here and no great Nation can afford to neglect it.

F.W.B.

30

THE OUTLOOK ON AVIATION: By The Asst. Editor.

Foreign Aviation .

We have received the Bulletin of the Italian Aeronautical Society November 12, 1908. It contains, under the head of Aviation, descriptions of the following aerodromes:— Wright, Farman's triplane, Bleriot VIII, Bourdariot, Le Jeune, Zipfel, Kress and Demanest. Also are given descriptions and illustrations of the following light motors for aeronautical purposes. Gnome, Redbridge, Garbon-brille and Farcot.

It also contains a description of a new form of cannon which will send projectiles directly overhead. They use an ingenious plan of telling where a shot has been placed. The projectile emits a smoke which floats in the air in the path of the projectile. The cannon used is much like an ordinary cannon except that it has greater clearance from the ground and its wheels fold in toward each other and lock in this position.

The Grade Triplane :— Baron Pierre de Caters entered for the prize of 1 kilometer given by the Aero Club of Belgium, made at Brecht on the 20th of December, in his biplane constructed by the Voisin Brothers. Several flights in one of which he attained 111 m.

The Jorch Aeroplane :—An aeroplane, constructed by M. Hans Jorch, had flown 19 m at Mayence during the first part of January 1909.

31

Spanish Aviation :— The King of Spain has asked Capt. Kindelan to go to France and America in order to assist in experiments in Aviation. On this official mission Capt. Kindelan will be accompanied by one of his comrades.

An Aviation Society is being formed at Barcelone.

The Aerial Touring Club of France :— This Club which has been recently formed by the Touring Club of France, has just voted a grant of 100 francs in favor of the subscription opened by the Aeronautical Club, having as an object the offering of a prize to the aviator who will be the first to accomplish a distance of 100 kilometers from one town to another.

The R.E.P. Aeroplane and the R.E.P. Motors :— Among the most admirable stands at the Aeronautical Salon and the first thing which ought to be mentioned is the magnificent installation of the R.E.P. establishment.

Mr. Robert Esnault-Pelterie is without doubt the only French Aviator who has himself invented, calculated and constructed, by his own personal means and in the smallest details, machines which have taken the air the first time. Before inventing his definite models he had experimented with diverse types of biplanes and monoplanes. His de ? b ut, as aviator, dates back to 1903. Esnault-Pelterie is then, among his contemporary aviators, in age, the youngest, in profession, one of the oldest of aviators. After comparisive trials the youn? aviator finally setteled on the monoplane type which he considered as superior, and capable of speed combined with suppleness and great stability.

32

General Characteristics :— The R.E.P. 2-bis embodies the characteristics of his former machines.

Its characteristics are:— Monoplane with a pair of supple wings which may be warped at the will of the operator. The rear supporting surface of the machine is made to act as a control. The starting device consists of two wheels in tandem under the body and a light wheel at the extremity of each wing.

The machine is 9 m 60 in breadth and 8 m in length. Its supporting surfaces: 420 kil. by 15 sq. m 175, that is, 26 kil. 600 in sq m.

The Body: — It is spindly-like, made of frames and tubes of steel of triangular construction, indeformable in every way (probably tetrahedral).

The Wings :— The greatest and most sought for quality of an aeroplane and one which sums it up more than anything else is the relation of its weight as compared to its dimensions. The R.E.P. 2-bis employs a most perfect surface.

The wings of the monoplane R.E.P. 2-bis are 9 m 60 in breadth. Their surface is 15 sq. m 75. The weight of the machine in flight being 420 kil. They are capable of lifting per sq. m 26 kil. 600 at a speed of 60 kilometers per hour.The wings are made up of united wood fibres breadthwise which join the two beams, one running along the cutting edge of each wing. These beams must be remarkably supple as also must be the whole construction of the wings in order to allow of warping.

33

Each wing is attached to the lower part of the running gear by means of stays. These stays also control the warping of the wings.

The Controls and the Tail :— The horizontal control is in the rear. It is of single surface and constitutes the tail of the machine. The vertical control is placed under the rear extremity of the frame. In shape and in relative position to the machine it is very like the rudder of a boat.

The operator is seated in the cock-pit. His body is well protected from the wind of advance as he is housed in on all sides.

The R.E.P. 2-bis Motor and the R.E.P. Propeller: — The motor of the monoplane R.E.P. 2-bis is of 30–35 H.P. and contains 7 cylinders. The weight of the R.E.P. motors, equipment complete but carrying no water, is remarkably light. The 20–25 H.P. weighs 53 kil. 500. The 30–35 H.P. weighs 68 kil. The 40–45 H.P. weighs 97 kil. Weight of the radiator 9–10 kil.

The propeller of the R.E.P. 2-bis monoplane is of metal containing four blades 2 meters in diameter.

The oil-tank contains 6 liters and the gasoline tank 40 liters which makes possible the continuous running of the engine for two hours.

The year 1909 seems to have opened with quite a number of aeroplane accidents in France.

The Antoinette monoplane, operated by Welferinger, 34 after having made many successful flights at Issy, met with an accident early in February in which the right wing was badly damaged. A few days following this the Vendome monoplane, which was exhibited at the Salon at Paris, was wrecked at Dagatelle. We have a report from Issy that the Obre monoplane was completely wrecked after an unrecorded flight of no consequence.

Bleriot, on the other hand, seems to have been more fortunate. Though he has been making many flights with two machines he has had no serious accident of late.

On the 18th, 19th and 20th of January he made a number of successful flights with his monplane No.9. The dimensions of this machine are as follows:— 12 meters long, 10 meters wide with a surface of 25 sq. m. The motor is 50 H.P. with 16 cylinders and a radiator which neatly conforms to the body of the machine.

Bleriot also has a smaller monoplane No.11. This machine, though its weight is not materially less than the No. 9, has materially less surface. Thus it may be seen that it requires a greater speed in order to support itself. The dimensions are as follows:— 7 meters long, 7 meters broad with 15 meters of supporting surface. Its weight with operator on board is 250 kilos. It is driven by an Esnault-Pelterie 25 H.P. motor. Perhaps the most interesting characteristic of this machine is the warping of the front and the rear control for lateral stability.

Bleriot stated not long ago that his smaller machine, 35 No. 9 is vastly more difficult to control than his larger machine.

It is stated in La Revue d'Aviation that MM Paul Tissandier, Alfred Leblanc, Delagrange, Garnier and Papeyre, and a number of Italian and Spanish Officers will be instructed by Wilbur Wright in the control of his machine. It also states that in case Orville Wright is recovered by April, Wilbur Wright will come to Fort Meyer to fill the conditions of the American contract and Orville Wright will continue his brother's work in France.

La Revue states that the new Society which has been formed for the sale of machines has already succeeded in selling fifteen Wright machines.

The activity o i n France in the way of Aviation is something to be envied. There are the Wrights with their biplane and the Voisin Brothers with their three types, the biplane and the triplane and the Goupy type. Bolotoff, Farman, Moore-Brabazon, de Caters, Henry Fourneir, Goupy, the Vivinus and Zipfel, all experienced aviators, are daily making trials and are endeavoring to give the world a perfect aeroplane.

There is a report that Farman may install in his new machine an American engine, water-cooled 70 H.P.

Moore-Brabazon is at present stationed at Mourmelon where he has taken up again the trials of his biplane in company with Bagriel Voisin. The French seem to place great faith in Brabazon and La Revue predict ? s for him a great future.

36

The Goupy triplane has undergone a few changes. As it stands it contains 45 square meters of supporting surface.

Zipfel has gone to Germany where he will make experiments at the Tempelhof camp of manoeuvres near Berlin.

G.H.B.

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXXIV Issued MONDAY, MARCH 1, 19?9

ASSOCIATION'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell Assistant Editor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO.XXXIV ISSUED MONDAY MARCH 1, 1909 .

Beinn Bhreagh, Near Baddeck, Nova Scotia .

TABLE OF CONTENTS .

ILLUSTRATIONS.

1

EDITORIAL NOTES AND COMMENTS .

A Combination Front Control .

Feb. 16, 1909 :— Gardiner Bell showed us to-day a crude model, which he had made with his own hands, of a front control operated by two levers combining the functions of front control, steering rudder, and balancing rudders. The apparatus was ingenious an suggestive, and I have asked him to give an account of it in this Bulletin. A.G.B.

Russian Propeller .

Feb. 19, 1909 :— Mr. Chanute has directed our attention to a new propeller constructed by Col. Ochtcheuny of Russia which is stated to have twenty times the efficiency of a perfect screw propeller of equal diameter (see BulletinXX p.42 The description unfortunately is insufficient to enable us to reproduce the propeller here so as to test the truth of the rather startling statement. Mr. Chanute has been kind enough to write to Russia for further descrip?ions (see Bulletin XXIX p.4) but with rather poor results, but he now sends us a cutting from a Russian newspaper which purports to give a full description of the propeller; but, as the article is written in the Russian language and is not accompanied by an illustration we can make nothing of it. We hope however, that we may obtain a useful translation from Mr. George Kennan, or from the Russian Embassy in Washington. At present we only know that each blade is shaped 2 2 somewhat like a bird's wing; wide near the hub and narrow at the tip; of concavo-convex form; and with the front edge stiff and the rear edge elastic.

The very startling differences observed in Baldwin's experiments between the effects produced by a hydro-curve and a hydroplane (which were hardly distinguishable from one another by eye) have led me to think that there may be some truth in the claim put forth for the Russian bird-wing propeller, and that we should therefore make some experiments with concavo-convex propellers stiff at the front edge and elastic at the rear.

I brought the matter up at one of our recent conferences and it was decided to have such a propeller constructed. Mr. Bedwin to-day (Feb.19) showed us the completed propeller. It is ten feet in diameter and though it does not taper at the end like the Russian propeller it possesses the other features described. We can compare its efficiency comparatively with the 10 ft. propeller to be used on Drome No.5. I have asked Mr. Bedwin to give us some description of it for this Bulletin. A.G.B.

Drome No.5 — Bell's Cygnet II .

Feb. 19, 1909 :— The new Curtiss engine has been installed on Drome No.5, and the ten-foot propeller is ready for attachment.

A large number of young people from the Baddeck Academy visited the Laboratory to-day and were shown the machine. 3 3 I took advantage of their presence to give the aerodrome a specific name, and called it Cygnet the Second. It will now be known officially as “Drome No.5, Bell's Cygnet II”.

Mr. Brenner, a Hammondsport photographer, arrived at Beinn Bhreagh to-day in time to take a photograph of the assemblage. A.G.B.

The Plans of the A.E.A .

Feb. 19, 1909 :— The time for concluding the Experimental work of the Association has very nearly come, and it is obvious that we will have no more than time to complete the experiments already planned out, if indeed we have time enough for that.

(1) We must try Drome No.5, Bell's Cygnet II, as soon as possible so as to get some idea of what we can do with an aerodrome of pure tetrahedral construction without any horizontal surfaces. The conditions unfortunately are very different from those originally contemplated. The structure itself is much heavier than would be necessary if we were to fly it as a kite. Without any engine or man it now weighs 400 lbs. What it will weigh with engine and man and all the accessories is problematical, probably more than twice as much. It is obvious that the structure, with man and engine, will be altogether too heavy to be flown as a kite in the way Cygnet No.I was flown. Besides the season is not suitable for such an experiment as we would have to depend upon natural wind unaided by the pulli ? ng power of a 4 4 steamer, for the Blue Hill is frozen in for the winter. The only thing to do therefore, if we are to make the experiment at all, is to try Drome No.5 on the ice as the “Red Wing” was tried on Lake Keuka. Even here it becomes obvious that the machine is too heavy to afford much hope of success. All we can do however is to try it and see what will result.

(2) Immediately after the trial we should push our Drome No.6 to completion as far as possible by constructing the aerial part of the apparatus on the basis of the Oionos Kite. It will take some time to make this structure and, while it is being made, we can make experiments on the ice with McCurdy's “Silver-Dart”.

We can try the Oionos structure quite independently of the boat part, if desired, upon the ice. If the ice leaves us before we are ready, the open water will be left and we can try it upon the “Query”. This is really all the experimental work that we can contemplate, but we can utilize our time by sandwiching in experiments upon propellers upon the ice-boat, in testing various other points, and in trying toys.

The original object of the Association was simply “To get into the air”. This object has been fully accomplished even though we should meet with no further success with Nos.5 and 6. We have made four aerodromes, each of which has successfully flown, propelled by its own motive power and carrying a man. Without any further experiments therefore we are prepared to construct flying-machines that 5 we know will fly. We have applied for patents upon these machines and upon our success in obtaining patents will depend the possibility of our getting outside capital to put our machines into commercial use.

It is obvious, however, that we could at once begin to obtain pecuniary returns by exhibitions of the two successful machines we possess, Curtiss' “June Bug” and McCurdy's “Silver-Dart”. The only difficulty in doing so is the fact that is very obvious to my mind that the moment we begin to make money by the construction or exhibition of aerodromes we will find ourselves involved in litigation with the Wright Brothers and others, and it would not be wise upon our part to attempt anything of the kind without having sufficient capital at command to protect us should litigation arise. I am very much averse to attempting to j m ake money under our present organization, or under any organization that would throw the financial responsibility upon me alone, for I am the only member of the Association that could be touched in the matter. If we are to do anything immediately in a commercial way we shall have to begin without the protection of patents for it will take a long time for the Patent Office to pass finally upon our pending applications. We have no funds, as an Association, even to pay the cost of applying for patents, and without a patent, or the assured prospect of obtaining one, it is extremely unlikely that we can get outside capital into the enterprise.

6

6 I think that we better consider some proposition to submit to Mr. Charles J. Bell, our Trustee, upon this matter. It would not take any large amount of money to start exhibitions

of the “June Bug” and “Silver-Dart”, and to begin the building of another aerodrome, but such work must necessarily be done under the auspices of an organized Company.

The questions then arise,

(1) Shall we go ahead and organize a Company ourselves bringing into it a sufficient amount of capital to begin the work contemplated with the prospect of increasing the capital from outside sources when patents have been secured?

(2) Shall we attempt to have a special Company organized by outside parties and sell out to that Company our interests in the work of the Association for a certain number of fully paid up shares? I doubt the practicability of this so long as we have no patent.

(3) Shall we sell out our interests in the work of the Association to some Company already organized for shares or cash? This also seems to me to be impracticable until we have secured patents. Without patents we have nothing to sell. When we do sell anything it will be a patent.

Looking the whole matter therefore squarely in the face it seems to me we are confronted by the following conditions. We can do nothing on plans 2 and 3 until we have obtained patents; that is, upon these plans, we must wait months before begining any commercial exploitation.

On the other hand if we decided to make an immediate commercial exploitation we are reduced to plan I. That is we 7 7 must organize a Company ourselves. In other words, we, the members of the Aerial Experiment Association, including the representative of the Late Lieut. Selfridge, would constitute the Company, and we would have to sell shares to outside parties to obtain the necessary initial capital, which need not be large. It would be necessary, however, to have a large number of shares in the Treasury of the Company to be sold from time to time as capital might be required.

We must face the condition that it will be very difficult to get outside capital to come in excepting in small amounts until after we have obtained patents. In the meantime we would have to risk the possibility and probability of being involved in litigation against our will, and this litigation if it arose would prevent the influx of capital from outside sources by shaking the confidence of would-be inventors.

I see no other way of doing anything practical without delay excepting through a Company organized by ourselves. Whether this is practicable or not depends upon what amount of money would be needed for commercial exploitation during the first year; what amount of money we could have taken up by ourselves and our friends; and upon what amount of money would afford a reasonable assurance against the costs of litigation during the first year.

The idea that is vaguely growing in my mind is that we should organize “The American Aerodrome Company” to exploit the aerodromes evolved by the Aerial Experiment Association and have Mr. Curtiss manage the business end of the 8 matter.

I would therefore ask Mr. Curtiss what he thinks would be the minimum amount of money required for the first year considering the fact that we have already two aerodromes completed that can be used for exploitation purposes. He should also include in the estimate the manufacture of at least one other aerodrome at Hammondsport. Then let us consider how far it would be possible to raise this amount of money and a sufficient amount more to pay the expenses of a moderate amount of litigation.

Should we find any reasonable prospect of raising this amount it would be worth while formulating a scheme to be presented to Mr. Charles J. Bell (for I very much fear that the initiative in this matter will have to come from us). Mr. C. J. Bell is a busy man, fully occupied with important business matters, and we should not rely too much upon his good will and interest to initiate a plan for us. We should decide first what we want to do; and then submit our plan to him for criticism. If, as a business man, he does not approve, our proposition may stir him up to suggest an alternative plan.

This is the best I can think of at the present time, and I do not think we can occupy the short time remaining to us as an Association to better advantage, than by discussing the question of our entrance into the commercial field.

A.G.B.

9

9 Suggested Plan for Converting the Association into a Joint-Stock Company .

Feb. 20, 1909 :— At a conference held Feb. 19 the foregoing notes concerning “The Plans of the A.E.A” were read and discussed. The idea of converting the Association into a joint-stock company seemed to be received with favor and it was decided to formulate some plans for accomplishing this result to be considered at a subsequent conference. I would therefore suggest the following tentative plan as a basis for discussion:—

Let us proceed to form a company to be known as “The American Aerodrome Company”, to be organized under the laws of the State of New York with its headquarters at Hammondsport and with a nominal capital of $100,000, divided into 1000 shares of the par value of one hundred dollars, or 10,000 shares of the par value of ten dollars — the latter plan might possibly be preferable.

To this Company let the Aerial Experiment Association transfer all its property, and inventions relating to Aerodromics, receiving in return the amount of money it has expended upon experiments , in the form of fully paid up shares, at par and non-assessable. The expenses of patenting the aforesaid inventions to be assumed by the Company.

This would dispose finally of the Association. It would go out of existence and the Company would take its place.

10

10 The fully paid up shares of the Company received by the Association would be distributed as follows:—

FIRST. To Mrs. Bell would be given one per cent of the shares received for every $1000 dollars she had contributed to the support of the Association; and the remainder of the shares received would be divided equally between A.G. Bell, J.A.D. McCurdy, F.W. Baldwin, G. H. Curtiss, and Mr. Selfridge (the representative of the heirs of our late member Lieut. Selfridge). The fully paid up shares of the Company would belong to the above named persons individually and they would be the first and only stockholders of the new Company. The remainder of the nominal capital of $100,000 in the form of undistributed shares, would be placed in the Treasury of the Company subject to their disposal.

At this stage the Company would exist without any working capital in the form of cash and it would be necessary to raise money by the sale of some of the undistributed shares in the Treasury. The Company (that is, the above named individuals) could then order some of the shares in the Treasury to be sold; the stockholders (that is, the above named individuals) to have the right to subscribe for the stock at par in proportion to their several holdings. Should any shareholder decline to take up his full pro rata share, then the stock not so taken up should be sold to the highest bidder, but not for less than par. The same method should be adopted in any subsequent issue of stock.

The estimate of running expenses made by Mr. Curtiss seems to indicate that we could support the Company for a year if we could raise the sum of ten thousand dollars as 11 working capital. Then, when we have some income from any source, a portion of the earnings could be laid aside to form a sinking fund, and the remainder distributed among the shareholders as dividend.

Now let us see how this would work out in practice.

Mrs. Bell has agreed to contribute a sum, not exceeding in the aggregate $30,000. She has done this, but our Treasurer reports that m i o re will be needed to support the Association to the end of March. He estimates that total at $34,000, and this is probably a conservative estimate. Mrs. Bell has set her heart upon the success of the Association and will do her best to support it to the end of its allotted term, which will probably involve her in a total expenditure of (say) $35,000. She can do no more than this so there is no use considering a further extension of time. No other means of support has presented itself and the Association will have to come to an end on the 31st of March.

Now let us assume that the actual cost of our experiments has been $35,000 (contributed by Mrs. Bell). We organize the Aerodrome Company on a basis of $100,000, and set aside $35,000 in fully paid up shares to be given for the property and inventions of the Association. The balance of $65,000 to remain in the Treasury of the Company to be sold for cash as required.

The Association gets $35,000 in fully paid up shares, which would be distributed as follows:—

12

12 Mrs. Bell would receive 35 per cent of this amount, and the remaining 65 per cent would be divided equally among the five members of the Association giving 13 per cent of this amount a piece.

Distribution .

Mrs. Bell 35% par value $12,250

A. G. Bell 13% par value 4,550

McCurdy 13% par value 4,550

Baldwin 13% par value 4,550

Curtiss 13% par value 4,550

Selfridge 13% par value 4,550

Total 100% par value $35,000

We would own these shares individually in the proportion shown above and could sell them or dispose of them as we think best.

In addition to this we would own collectively, as "The Company", the property and inventions of the A.E.A., and have in our Treasury $65,000 in the form of undistributed shares.

It would be necessary to sell some of these Treasury shares to raise cash for working capital say $10,000, and we would have the right to buy them ourselves at par in proportion to our holdings of stock.

If we can personally, or through our friends, take up the shares we are entitled to buy the following would be the amount to be subscribed by each shareholder.

13

Amounts to be Subscribed .

Mrs. Bell (35%) $3500

A. G. Bell (13%) 1300

McCurdy (13%) 1300

Baldwin (13%) 1300

Curtiss (13%) 1300

Selfridge (13%) 1300

Total 100% $10000

This would require $4800 to be subscribed by Mr. and Mrs. Bell or their friends, and $5200 to be provided by the friends of McCurdy, Baldwin, Curtiss, and Selfridge. Mrs. Bell and I can undertake to find purchasers for our porportion ($4800) if the others can dispose of the remainder ($5200).

Id McCurdy, Baldwin, Curtiss and Selfridge and their friends are not able to subscribe $5200 in all, it is hardly worth our while considering the formation of a Company at the present time. We cannot go to the public until we have patents, and Mrs. Bell and I do not care to go into the matter alone. A.G.B.

14

14 FIRST TRIAL OF CYGNET II

Feb. 22, 1909 :— We have waited long for the arrival of the new Curtiss engine to try an experiment with Drome No.5, Bell's Cygnet II. At last it came and was duly installed last Friday (Feb. 19); but the smooth slippery ice upon which we depended had disappeared under about a foot of snow, so that the outlook for a successful experiment was disappointing.

We were considering plans for clearing off a track when a rain-storm on Saturday (Feb.20) saved us the trouble. Heavy rain and a comparatively high temperature began to melt the snow. On Sunday evening (Feb.21) the rain was succeeded by frost; so that to-day

(Feb.22) ideal conditions were presented for an experiment:— Glassy ice, no wind, and a beautiful sunshiny day.

We therefore determined to make an experiment without waiting to test the ten-foot propeller that had been prepared, and ascertain the proper gearing for the engine. The inevitable fussing over minor details that always occurs at the last moment took ? u p the whole forenoon, so that it was afternoon before all was ready. The results are recorded among the experiments noted in this Bulletin.

It was hardly expected, on account of the great weight of the machine (over 950 lbs), that it would rise from the ice, and in this we were not disappointed! It is obvious however that the engine was overloaded with the ten-foot propeller at a gear ratio of 1–2 so that it did not give us its full power. A. G. B.

15

FIRST FLIGHT OF THE SILVER-DART IN CANADA .

Feb. 23, 1909: — This is a red letter day at Beinn Bhreagh. McCurdy flew over Baddeck Bay in the Silver-Dart about half a mile. This marks a clearly historical event:— The first flight of a flying-machine in Canada. A.G.B.

SECOND FLIGHT OF THE SILVER-DART .

Feb. 24, 1909 :— McCurdy made a magnificent flight of four and a half miles to-day in the Silver-Dart, circumnavigating or rather circumdroming Baddeck Bay. Our only regret is that Mr. Baldwin and his wife were not present to witness this great flight. Official congratulations have been received from the town of Baddeck. A.G.B.

DEPARTURES FROM BEINN BHREA GH.

Feb. 26, 1909 :1— Mrs. Bell, Miss Cadel, Mrs. Curtiss, Mr. Curtiss and Mr. Gardiner Bell left Beinn Bhreagh to-day. Mr. and Mrs. Baldwin left sometime ago so that Douglas McCurdy and I remain as the sole representatives of the A.E.A.

A.G.B.

16

EXPERIMENTS: — Reported by the Editor .

Kite Model of Drome No.6.

Feb. 13, 1909 :— The white Oionos Kite shown in Bulletin XXX p.13 has been repaired. It was tried this afternoon flown by a Manilla rope 100 m long from a point 50 cm in front of the center of the kite. The kite had been strengthened with beading where the strain of the line came (see Bulletin XXX p.19). Weight of kite 17825 gms or 39.26 lbs. Weight of flying-line 5328 gms or 11.74 lbs.

Exp.I Wind 13.20 00 mph Pull Alt 25 32° 30 33° 50 34° 60 46° 50 43° 30 44° 20 46° 15 38° 40 36° 50 45° 370 397° Exp.2 Wind 14.25 mph Pull Alt 60 44° 70 43° 60 38° 40 48° 50 45° 80 50° 30 52° 80 48° 30 58° 30 50° 550 476° Exp.3 Wind 16.00 mph Pull Alt 70 46° 40 48° 60 47° 40 49° 60 45° 40 43° 60 48° 40 43° 60 44° 30 38° 500 451° Exp.4 Wind 13.50 mph Wind 12.25 mph Pull Alt 40 38° 50 40° 10 45° 40 35° 50 37° 20 38° 40 40° 30 45° 50 43° 60 45° 390 406° Exp.5 Wind 13.40 mph Pull Alt 20 44° 30 43° 40 40° 40 41° 30 42° 40 40° 30 38° 30 40° 50 38° 20 40° 330 406° Exp.6 Wind 12.25 mph 40 40° 20 33° 50 35° 30 37° 20 37° 10 33° 30 33° 30 38° 50 40° 50 33° 330 359° 17 2 Exp.7 Wind 13.20 mph Pull Alt 20 38° 40 35° 80 40° 40 40° 70 39° 80 45° 60 42° 70 44° 60 45° 60 42° 580 410° Exp.8 Wind 13.00 mph Pull Alt 40 40° 30 41° 50 40° 40 39° 50 40° 60 45° 60 48° 70 37° 60 47° 60 46° 520 423° Exp.9 Wind 14.40 mph Pull Alt 30 48° 60 44° 30 48° 70 43° 60 49° 60 48° 60 45° 70 43° 60 47° 60 46° 560 461° Exp.10 Wind 14.50 mph Pull Alt 70 42° 30 50° 60 49° 60 43° 60 45° 70 47° 30 50° 60 47° 60 50° 70 50° 570 473°

On the following page I give in a summary table the aggregate readings and the general averages; and also a calculation of the efficiency of the kite:—

18

3 SUMMARY TABLE .

Pull Altitude Wind Exp. Obs lbs Obs Angle Obs mph Exp. I 10 370 10 397 1 13.20 Exp. 2 10 550 10 476 1 14.25 Exp. 3 10 500 10 451 1 16.00 Exp. 4 10 390 10 406 1 13.50 Exp. 5 10 330 10 406 1 13.40 Exp. 6 10 330 10 359 1 12.25 Exp. 7 10 580 10 410 1 13.20 Exp. 8 10 520 10 423 1 13.00 Exp. 9 10 560 10 461 1 14.40 Exp. 10 10 570 10 473 1 14.50 Summation 100 4700 100 4262 10 137.70 Average 47.00 lbs 42°.6 13.77 mph

If the angular altitude betaken as 42° 30' then the sine is .676 and the cosine is .737.

Therefore with a total pull of 47 lbs. the vertical pull is 31.77 lbs and the horizontal pull 34.64 lbs. The horizontal pull expresses the drift.

The lift includes the weight of the kite 39.26 lbs, the weight of the flying-rope 11.74 lbs, and the vertical pull 31.77 lbs. Total lift 82.77 lbs.

Efficiency =Lift/drift

Efficiency =82.77/34.66 = 2.4

That is the lift is 2.4 times the drift.

19

4 Remarks :— The Kite flew quite steadily during the above experiments 1-10, although I thought I detected a slight tendency to longitudinal oscillation.

It went off the wind occasionally tipping down one wing; but the motions were deliberate, there was no tendency to slide down the hill sideways as with structures of the Hammondsport type, and there was a graceful and deliberate recovery of position.

The attempt was then made to increase the length of the flying-rope to 200 meters. A squall came, and the kite went to one side off the wind and began to come down slowly by the head. The line was released in time to prevent a bad smash, but failed to save the kite from damage altogether.

It is proposed to remodel this kite so as to convert its aeroplanes into aero-curves, and test its efficiency under the new condition.

We next tried a half-sized model of Drome No.5, in order to make a direct comparison with the preceding experiments with the model of Drome No.6.

Kite Model of Drome No.5

Feb. 13, 1909 :— Flying-rope 100 m long attached 100 cm from center of kite. This kite is composed of 738 tetrahedral winged-cells: Surface 39.9442 sq. m (say 40 sq. m). Weight of kite 19295 gms or 42.5 lbs. Weight of rope 5328 gms or 11. ? 7 4 lbs.

20

5 (Model of No.5)

Exp.11 Wind 15.40 mph Pull Alt 70 28° 80 29° 100 33° 130 32° 80 31° 80 29° 70 30° 140 27° 100 30° 140 30° 10 Obs 990 299° Aver. 99.0 lbs 29°.9

Remarks:— The kite was beautifully steady in the air inspite of the gusty wind.

The flying-rope was then let out until it was 200 m long. Weight of rope 10,646 gms or 23.45 lbs.

Exp.12 Wind 13.45 mph Pull Alt 90 29° 80 28° 90 28° 120 29° 90 28° 100 26° 110 28° 80 29° 90 28° 90 28° 10 Obs 940 281° Aver. 94.0 lbs 28°.1

Remarks:— The kite seemed to be perfectly steady in the air. In both experiments 11 and 12 the stability was 21 6 manifestly superior to that of the Oionos model used in experiments 1–10.

The kite made a bad landing and was somewhat damaged, but this was due to a mistake in handling it. The rope was caught on the cleat, so that a continuous steady pull on the line could not be made while the kite line was being overrun, and no bow-line was used to reduce the strain on the handling line. One end of the wing piece struck the ground, and the cells at that end were crushed in. The damage will be repaired. A.G.B.

22

Hydrodrome Toy .

Feb. 16, 1909 :— As suggested Mr. Bedwin has had made another hydrodrome toy, keeping the nicely finished tin hydrodrome (Bulletin XXXI I) as a model of the Cygnet Query . The present one is a small toy boat of wood decked in, and provided with four sets of tin hydrodromes, one on either side near the bow, and one on either side near the stern. The surfaces looked very small although having an area more than twice as great as those used on the model of the “Query”.

This baby hydrodrome was to-day floated in a bathtub and towed by a string when it at once rose out of the water on the hydro-surfaces, but the result did not seem to be sufficiently striking to be of much interest to a child. For this purpose we need exaggerated effects.

The model has been sent back to the Laboratory to have larger surfaces attached. The area will be increased four-fold and simple hydroplanes will be employed which will be twice as deeply submerged so as to permit the boat to lift twice as high out of the water when towed by a string. A.G.B.

Flying Toy .

Feb. 19, 1909 :— Gardiner Bell to-day submitted a new flying toy which he thinks might form the basis of a new game for children. It is an attempt to utilize the principle of the ordinary paper dart formed by fl o l ding a piece of paper so as to make a dart offering an acute angle to the line of advance. The model shown to-day was made of aluminum but was too heavy for the surface involved. A launching apparatus was 23 2 placed on the floor and released by pulling a trigger when the dart was projected by the reaction of a coiled spring. Gardiner Bell proposes to suspend a ring as a target and have children try to shoot their dar s t s through the ring. The present dart proves to be too heavy for the purpose and another lighter one has been ordered which will be of silk over a framework of wood. A.G.B.

24

Drome No. 5, Bell's Cygnet II

Feb. 22, 1909 :— Experiments were made this afternoon with Drome No. 5, Bell's Cygnet II. Before starting for the ice I read to the men at the Laboratory the following note concerning the plan of the experiment:—

The object of the experiment to be tried this afternoon with Aerodrome No. 5, Bell's Cygnet II is first, to test whether it will rise into the air, and second, whether while it is in the air it has the lateral stability displayed by kites of pure tetrahedral construction.

On account of the great weight of the machine, exceeding 950 lbs. with man and engine and all, it is extremely doubtful whether the machine will leave the ice. We want to test this point and not to make a flight.

Mr. McCurdy is requested when he lifts the front control to get into the air, to make only a short flight if the machine rises; and to go at no great elevation above the ice. A horizontal flight of from 1 to 200 hundred feet will be sufficient to let us judge of the capabilities of the machine in her present condition.

Mr. McCurdy will tell Mr. Bedwin exactly what he proposes to do, before he starts; and Mr. Bedwin will scatter a few men at points near the proposed landing place so as to be at hand when the aerodrome alights.

Mr. McCurdy will be careful to come down soon enough to allow the machine to have clear ice ahead of it for at least a quarter of a mile so that she may come to rest without striking against the shore, and so avoid any accident like that we had recently with the ice-boat.

The photographers should be scattered to one side of the line of flight so as to increase the chances of getting a good picture.

The Cygnet the II was then taken out upon the ice of Baddeck Bay which must have been very thick for half the 25 2 people of Baddeck seemed to be there, well concentrated upon the ice near the machine:— People on foot and people in teams.

A breeze had by this time sprung up of not less than six miles an hour from the southwest, so the machine was taken over the Bay, near Carruth's place. Mc. Curdy took the aviator's seat and the machine was turned round to face the wind, and the engine started.

Although the motor was evidently not developing its full power the push of the propeller must have been considerable for the men were unable to hold the machine on the slippery ice and were obliged to let go. The machine did not however acquire much speed for the skaters upon the ice easily kept up with it.

After gliding for about 100 meters upon the ice the engine stopped, or perhaps was purposely stopped by McCurdy. After some delay the machine was started again with the same result.

I understand that on one of these trials, probably the last the pipe leading from the gasoline tank broke, so that the engine had to be stopped.

A third trial was then made, and it was obvious from my distant point of view that the engine was working better than before. The machine began to gather speed, but just as we were hoping she would take the air, a noise like and explosion was heard and the experiment came to an end.

The noise was due, not to an explosion, but to the sudden snapping of the propeller shaft following which the 26 3 propeller was thrown violently on the ice and broke in three pieces.

Further experiments are postponed until another propeller can be made. While this is being done the engine will be transferred to the “Silver-Dart”, which will be tried upon the ice.

As ageneral conclusion we find that the engine is overloaded with a ten-foot propeller having a gear ratio of 1–2. We propose therefore to make two propellers, one of 9 feet diameter to be used with the present gear ratio of 1–2, and another of 10-feet diameter employing a gearing of 1–3.

While the results to-day were not unexpected, we are encouraged to think that with arrangements which will permit of the engine developing her full power we may be able to raise the machine into the air so as to observe its stability. One point that has been demonstrated to-day is, that a vertical rudder placed in front instead of behind controls the horizontal steering of the machine. The action of the wind upon it tended to turn the machine to port or stanboard, but even with the small velocity attained and with the r i e sistance of the long sledge-runners, McCurdy was easily able to steer the machine into the wind's eye.

A.G.B.

27

FIRST TRIAL OF THE SILVER-DART .

Feb. 23, 1909 :— The Curtiss engine was transferred from Cygnet II yesterday to the Silver-Dart, and this morning propeller experiments were made on the ice-boat machine to test which of the propellers we have would be most suitable for the experiment. A propeller

7 feet 8 inches in diameter was chosen which had been used upon the Silver-Dart in Hammondsport.

In the afternoon the Silver-Dart was taken out on the ice of Baddeck Bay; and a large concourse of people from Baddeck were present.

The congragation of people and teams upon the ice yesterday near the Cygnet II had shown the advisa v bility of policing the crowd and keeping them scattered, and at a distance from the machine. Mr. Charles R. Cox, Mr. P. L. McFarlan, Mr. Fred McLennan, and Mr. John Arsenault were provided with the following notice, which they displayed to visitors wherever necessary.

NOTICE.

In order to avoid the possibility of any accident visitors are requested to keep at a distance from the flying-machine Silver-Dart, and not congregate together on the ice. They should remain behind the machine, or well off to one side, and leave a clear field for the Laboratory Assistants. They should not on any account place themselves in the path of the machine in front. It would be dangerous to be struck by it.

Beinn Bhreagh, C.B. Feb. 23, 1909.

(Signed) Alexander Graham Bell Chairman Aerial Experiment Assoc.

28

This served its purpose, and the visitors kept well scattered.

I give below some notes of the experiments made today by Mr. McCurdy and by Mr. Curtiss; and it will be unnecessary for me to add any further description as my telegrams to the Press, which will be given in the next Bulletin, describe sufficiently the details of this the first flight of a flying-machine in Canada.

McCurdy's Account :— The morning of to-day (Feb. 23) was spent in getting the Silver-Dart ready for a trial flight. The transmission was changed from the four V-belt drive to a single chain drive which, it was anticipated, would not only give greater efficiency but would be of less weight. The gearing used was 18–24 (or 3–4), the engine turning over 24 revolutions to the propellers 18 revolutions.

We had three propellers; and to decide which one was to be used a series of tests was made on the ice-boat, although the ice-boat was not allowed to advance during any of the tests.

The propeller finally decided upon was one having a diameter of seven feet 6 inches, and a pitch at the tip of 20°–22°. This propeller was not one of constant pitch speed.

The Silver-Dart was finally taken across the Bay on the ice, and a start made at a spot just off Fraser's Pond.

In the first trial a gasoline pipe broke after the machine had traveled about 100 feet.

29

Upon fixing this a second start was made which was very successful. The machine rose from the ice after traveling about 100 feet; and flew at an elevation of about ten-thirty feet directly east for a distance of about half a mile. Landed without any jar whatsoever. The speed I sh l o uld judge to be about 40+ miles per hour. The machine was operated by J.A.D. McCurdy. McC.

Curtiss' Account: — In choo ii sin g a propeller for the Dart to-day (Feb. 23) we tried the three which were available on the ice-boat, to determine which would be best suited for the purpose, the desired speed being about 800. The results were as follows:—

Propeller	Speed	Pull
No.I	650	200 lbs.
No.2	550	112 lbs.
No.3	450	50 lbs.

We chose No. 1, a remodeled Hammondsport propeller. By speeding the engine we got 825 (about) revolutions with this propeller, which proved plenty for the requirements.

No. 1 propeller was seven feet 8 inches in diameter, about seven inches wide and 20° at the tip, pitch decreasing towards hub (not perfect screw), and had a curved face of about 1 in 16.

No. 2 propeller was seven feet four inches in diameter, about 8 ½ inches maximum width, and 22° ½ at tip, pitch decreasing towards hub, and had a curved face of about 1 in 12.

30

No. 3 propeller was eight feet in diameter, 8 inches wide and 22° ½ at the tip and a perfect screw. This propeller only had a flat face.

The Silver-Dart was given a most satisfactory trial to-day (Feb. 23). The speed was, I should judge, over 40 miles an hour; certainly more than we have had in any previous flights either with this or the other machines. The velocity of the wind was also greater than any in which we have attempted to fly before. G.H.C.

SECOND TRIAL OF SILVER-DART .

Feb. 24, 1909: — All the records of the Association have been eclipsed by McCurdy's magnificent flight of this morning of 4 ½ miles in the Silver-Dart. I have not time to write details as we are to try the Cygnet II again this afternoon with the Silver-Dart propeller. My press dispatches, and the following notes by McCurdy and Curtiss tell the tale. A.G.B.

McCurdy's Account :— The second flight of a flying-machine in Canada took place this morning (Feb. 24) at Baddeck, when the A. E. A. Drome No. 4, McCurdy's Silver-Dart, flew a distance of 4 ½ miles.

Sarted off Fraser's Pond, and headed up the Bay towards the Log Cabin. The turn to port was started there, making the circle as large as possible. Ran down Beinn Bhreagh shore crossed the sand beach at the plaster dump, and attempted a turn again to port just off William Taylors. 31 The space was however found to be too small in which to completely negotiate the turn, and so a landing was attempted.

The machine, however, struck her starboard wing on the ice, and spinning round smashed a few struts and chords. One wheel also was broken.

Curtiss No. 3 engine worked beautifully, not a skip all through the flight. The balance was about perfect, all the controls working well.

The power developed was sufficient not only to drive the machine against a 5–6 mile wind, but also with it. The feel of the machine was the same both with and against the wind. McC.

Curtiss' Account :— The flight of the Silver-Dart to-day (Feb. 24) was the best ever made by the members of the A.E.A. Everything worked perfectly. The machine raised quickly but steadily, and covered a distance, around the Bay, of perhaps 4 ½ miles at the rate of about 40 miles an hour.

McCurdy handled the machine perfectly, and the accident was caused more by a combination of circumstances, than by any fault of the aviator. G.H.C.

SECOND TRIAL OF CYGNET I I.

Feb. 24, 1909:— Unwilling to lose the opportunity of the ideal weather conditions prevailing to-day we transferred the engine and propeller from the damaged Silver-Dart to Cygnet II without awaiting the completion of the new nine foot propeller being made for her. Tried her on the ice just at dusk.

32

Three starts were made, but she did not rise into the air. During the third trial McCurdy (the aviator) shut off power on hearing something in the machine snap suddenly. This turned out to be one of the guy wires attached to the engine-bed and running up to the ridge-pole.

Why should this have snapped unless under tensional strain? And why should it have been under tensional strain unless the machine was beginning to lift the load of the engine off the ice? I look upon the snapping of the wire as an evidence that the machine had begun to reach?? a supporting speed.

It might be well, before making further experiments, to test the tensional strength of the parts supporting the engine and man, by supporting the machine so as to allow the engine etc. to hang without touching the floor. In all our tests the engine part has been supported from below, whereas in actual flight it will be supported from above. A.G.B.

33

CONCERNING PROPELLERS. THEIR RELATIVE POSITION TO THE AEROPLANE: By Gardiner H. Bell

Feb. 12, 1909 :— In a letter which appears in Bulletin XIX p. 23, Mr. Curtiss makes the suggestion that the application of power, parallel to the line of advance and well above the center of gravity, would insure safety in case of accident. His reason for this statement is as follows:— As long as the propeller is imparting forward motion to the machine it is exerting a downward pressure by virtue of its high line of thrust. In order to counteract this downward tendency it is necessary for the aviator to keep the front control continually at an elevated angle. Now suppose the engine stops during flight, the downward component goes out of play and the front control, being normally elevated, tends to lift the machine by the head as long as momentum continues. The point then is this, that immediately following the stopping of the engine the head of the machine is thrown up. We are dealing here with conditions immediately following a break down of the engine, or a disabled propeller. Obviously such action would practically eliminate the chances of an immediate fore-downward plunge. However there are other things to be considered.

If the line of thrust be above or below the center of gravity, immediately this thrust is discontinued, the balance of the machine will be changed. Indeed this is a necessary feature in the case of the high line of thrust. We have then different conditions with which to deal. The center of gravity is altered and the balance of the aeroplane 34 is upset. Headway has been checked because the machine is working against the force of gravity and it (the machine) being elevated at the bow is in a position to take a rear downward plunge when headway is lost.

Up to this point we have been dealing with conditions taking place <u>after</u> propulsion has failed. Let us now take the conditions existing <u>before</u> thrust has been discontinued.

A high line of thrust being applied continually is exerting a tendency to depress the front of the machine. It is not increasing the load on the main surfaces because the line of thrust is parallel to the line of advance. But it is necessaryily bringing into play continuous resistance of the front control in its efforts to keep the machine in the required direction. Speed has been sacrificed by loading the engine with unnecessary resistance and taking it all in all has safety been promoted?

I was under the impressions that during the conference the other day Dr. Bell made the statement that in case of accident it would be safer to have revolving propeller in the rear of an aeroplane rather than in front as there would be great danger of the aviator being thrown into the propeller were it in front at the time of impact of the machine with the ground. Let us consider the two cases first from the standpoint of safety and let us assume that in each case the propeller is revolving under power at the time of impact with the ground.

First consider the case in which our propeller is in front. The propeller, placed as it is, will be the first part of the machine to come in contact with the ground. The 35 3 revolving blades will be snapped off at the axis and through the action of centrifugal force will be hurled wide of the machine thus rendering the propeller harmless to the aviator even if he is thrown into its immediate vicinity.

Then too, the propeller being in front, it stands to reason that the engine would also be in front, and to my line of reasoning it would be an infinitely more pleasant sensation to land on top of an engine, whose propeller was embedded in the ground, than in the other case to run the chances of having an engine with the propeller, which we have every reason to believe, would continue rotating until it struck the ground, land on top of me.

A revolving propeller in front of a machine which it is sustaining in flight is throwing a constant current of air back upon its supporting surfaces. Now it is interesting to note just how this current of air, thrown back from the propeller, acts in connection with the machine. It does three things; and in order to make it clear let us consider these things as separate and apart from one another.

1. A portion of it acts upon free air imparting and maintaining a certain velocity of the machine.

2. A portion of it acts upon the under surfaces of the supporting surfaces of the machine thereby imparting an added lift.

3. Also a portion of it acts upon struts and such goes into head resistance.

In the above three cases we are considering the propeller as being in front of the machine, now let us consider 36 4 it in the rear. In both cases the relative lift imparted to the machine by the air is the same. It is the application of this lift that is different. In the case of the propeller in the rear the machine would speed up until there is the same pressure of air as in the former case. The velocity of the machine in the latter case will keep accelerating until the pressure of air in the two cases is exactly the same. In the first case, where the propeller is in front the speed of the air has been increased to support the machine. In the second case the speed of the machine has been increased until the pressure of the air is sufficient to support it in flight. This reasoning would seem to lead to the fact that in both cases we have the same lift, for the pressure of the air is the same. It is the velocity of the machine that is changed, not the lift. In the case of the propeller being in the rear there is as much power lost in dead resistance as there is in the case where the propeller is in front, because the pressure of the air in both cases is the same. The dead resistance remains the same, the lift is the same, but velocity is gained by having the propeller at the rear.

G.H.B.

37

FRONT CONTROLS: By F.W. Baldwin .

Feb. 13, 1909 :— There is a radical difference between a supporting surface and a control, which, it would seem, we overlook in the design of our machines.

It does not follow that the best shape for a supporting surface should be adopted in a surface which normally presents no angle of attack. A rudder of any kind is only called into action occasionally.

While it is true that sustaining surfaces, narrow in the line of advance, seem to be more efficient than ones which are as deep as they are wide, it by no means follows that this is the best form for a rudder surface of any kind.

Is it not reasonable to suppose that we are paying too much in head resistance for the increased efficiency of the controlling surfaces.

There is another point in favor of controls deep from fore to aft. It is well known that skin friction per square foot decreases with the length from fore to aft of the surface; and while the quantitative value of experiments on skin friction in the air may vary considerably, we know that in the water, where it is a large and measureable quantity it does decrease per square foot with the length of the surface.

Prof. Zahm's results, which are almost identical bear out Froudes experiments on water; and, for the sake of getting a comparison, let us accept them, and see how much we are paying in head resistance for our more efficient controls

38

Take a double-deck bow-control 12 feet by 2 feet giving a surface of 48 square feet, and compare it to a square 5 feet by 5 which would have a surface of 50 square feet.

Cutting edge 24‘ chords

struts 28

52‘ @ ½‘ ‘

52 ÷ 24 = 2.1 sq. ft.

@ coef. of # = .35

Wire 106

@ 1/16“ = .55 sq. ft.

@ coef. of ½ = .245

Total .60 sq. ft.

@ 40 miles per hr. pressure = 8 lbs.

Therefore head resistance = 4.80

Skin friction = 24 × .0138

@ 40 miles = .3312

Total 5.13 lbs.

39

Cutting edge 10‘

Struts 10‘

20‘

@ 1“ material 1.66 sq. ft.

@ coef. # = .28

Wire 45‘

@ # = .465 sq. ft.

@ coef. of ½ = .232

Total .28

.23

.51

@ 40 miles per hour = 4.08

8 lbs. pressure

Skin friction @ 40 miles per hr. = .0132 × 25 = .3300

Total = 4.4 lbs. Resistance less resistance about 15%.

Now it is obvious that the square surface control need not have material twice as much in cross section as the other one.

Instead of the 1“ stock referred to ½ steel tubing could be substituted to advantage — the size of the struts being sufficient to warrant it.

But even with 1“ stock and wire #“ thick it has less resistance than the narrow control.

It must be taken into account that with a surface nearly square the bending strains are materially reduced.

After working this out I am of the opinion that a large single surface control almost square is perhaps better than superposed arranged as we have them. At any rate the difference between a supporting surface and a rudder is worth thinking about. F.W.B.

40

FLYING-MACHINES, COMMERCIALLY: By G. H. Curtiss.

Feb. 15, 1909 :— Practically every flying-machine in existence has been built by experimenters and for experimental purposes. Little or no revenue has been derived from their use except perhaps the winning of a few prizes. Farman made one unsuccessful attempt at exhibition work and the United States Government have let two contracts which, as yet, have not been filled. Government contracts and exhibition work seem to be the two most promising sources of revenue. There are no prospects of the United States Government placing further orders for some time to come and when they do the Wrights will no doubt be in on the “ground floor”.

The Canadian Government might be induced to invest in an aerodrome or two especially if they were built in Canada, and I think this prospect should be diligently followed up.

Exhibitions may and may not prove profitable according to the way in which the undertaking is handled. Farman's exploit was certainly discouraging. An experienced man would be most likely to be successful in this field, that is one who knows how to get contracts and how to get the money after the contracts are fulfilled. There are now several cash prizes offered in America and still more abroad. But when you play for these big stakes you play against big odds and “there is many a slip etc”. However these cash prizes look very alluring. I think prize chasing and exhibition work should go hand in hand.

41

2 Of the score or more machines likely to be built the coming year there will be nearly as many different models and the manufacturer to get the business must, like the Voisin Brothers build anything that is wanted. Probably by another year the machines will become more standardized and a certain amount of business may be expected from private parties for machines for sport. Perhaps an Aerial Development Company could be formed to look after Government contracts, prizes etc. and get in shape to handle the large volume of business which is bound to come later.

G.H.C.

42

STRUTS, CHORDS, AND TRUSSED RIBS: By J.A.D. McCurdy.

Feb. 16, 1909 :— In reading through Sir Hiram Maxim's book on “Artificial and Natural Flight” one is struck by the fact that the work is pregnant with many practical ideas and valuable theoretical information which might be of the greatest importance to flying-machine experimenters, designers, or constructors.

The suggestions and hints are greatly streng?thened on account of having been subjected to experimental tests and the results obtained seem to thoroughly warrant their consideration.

His reference in Chapter I to the amount of horse power consumed in driving his machine through the air with no aeroplanes attached is very significant and points out the enormous waste of energy resulting from improper design of struts, wires, etc. etc., and in fact all members which are exposed so as to produce a resistance to motion along the line of thrust.

He very thoroughly and systematically conducted a series of tests with the idea in view of determining the cross-sectional form of strut, or chord, which would not only consume the least power in being pushed through the air, but which might at the same time produce an economical lift and so add to the efficiency of your machine. The best form arrived at was not the fish-shaped cross-sectional form in use on some of our machines, but a form having, both fore and aft, a rather sharp tapering, of equal design. The drift of such a strut was very much less than in the case of the fish-shaped, and the efficiency of this form of cross-section when 43 2 used as a lateral member was, at a low angle, about 6.

He is a strong advocate of the use of trussed ribs covered over with fabric on both top and bottom and in this connection he ?? su ggests a very important point. The efficiency of an aero curve when under way depends upon the surface holding its predetermined curve. Now with cloth applied in the ordinary manner this essential would be absent owing to distortion under pressure.

He not only criticises this fault but goes further and suggests a remedy. Cover the top of your ribs with a material such as rubber cloth which is absolutely air-tight and, as an underneath surface, use a cloth which is to a degree porous. Now the air is pressed through the under surface but cannot be forced through the upper surface therefore an air cushion is formed between the two cloths. This means that there is an equal atmospheric pressure on both sides of the under surface, hence no distortion will result.

In an actual experiment conducted by Maxim the efficiency of such a constructed aeroplane was about the same as that of an aeroplane formed up of rigid material.

We should, I think, take advantage of this important suggestion in the construction of aero curves. The front and back lateral chords to which the ribs abut could be made in two pieces the section being made laterally.

Now the top and bottom silks could be laced together at the front and rear with the outside section of the chords removed when they are replaced, the lacing of the silks would be completely hidden and so the curve would not only look well 44 3 but be very much "cleaned".

It is very unfortunate that Mr. Maxim omitted to print the results of his experiments with propellers in detail as such a series of results, would, at the present time, be very valuable. He however states as a general result that the thrust is always constant whether advancing or not. This we have yet to find out for ourselves on the ice-boat.

J.A.D. McC.

This paper is illustrated by blue print p. 54.

45

A NEW GAME: By Gardiner H. Bell .

Feb. 24, 1909 :— The following is a description of a flying toy. This toy consists of two parts, a launchway and a dart with a keel-stick which fits into a groove in the launchway. The dart is forced along the launchway by a spring which acts on the recoil.

The dimensions of the launchway are as follows:— 8 inches long by 2 inches wide and 1 inch deep. This launchway is set at an inclined angle so as to give projective force at a suitable angle for a glide.

The Dart is of triangular form 12 inches long and 6 inches at its face or rear edge.

In connection with the dart and launchway, a ring large enough to permit the dart to be shot through it might be used, and an interesting game might be played by trying to shoot the dart through the ring. G.H.B.

46

AERODROME MOTORS: By G. H. Curtiss.

Feb. 25, 1909: — The internal combustion or gas engine is without doubt the best power for heavier-than-air flying-machines, and it remains only to choose what type or style of gas engine is best adapted to the work. Of course there are possibilities in other forms of motive power but we consider only those which are now in practical use. If, as some people predict, flying-machines are to be as common as automobiles then motors should be as simple as automobile motors, and if possible even more reliable.

It is now conceded that very light motors are unnecessary and, may be undesirable if by their lightness their endurance and reliability is sacrificed.

Suppose we want an engine of 25 H.P. This should be sufficient for a flier to carry two men an hour or one man four or five hours (assuming that the engine will consume 30 lbs. of fuel per hour). What type of motor should we adopt? There is a choice of the two or four cycle type, air or water-cooled, double cylinder opposed, three, four or six cylinder vertical, 5 or 7 cylinder star and seven or eight cylinder staggered and others besides innumerable systems of ignition, lubrication, and valve action. With such an assortment it would seem difficult to make a choice but when we consider that simplicity and reliability are the most important requirements, I believe it is safe to eliminate all the types which can be considered in the experimental state and choose an engine which has been built by the 47 thousand, and is in constant daily use in automobiles, motor boats, e ct tc :— This is the four cylinder vertical.

The reason that this number of cylinders and type of engine is so popular is, that it give almost perfect balance, even torque, and in 25 H.P. size, can be built much lighter than an engine of one two or three cylinders.

Such an engine, with all accessories, including the cooling system, built of best materials and with all unnecessary weight eliminated, will weigh about 6 lbs. per H.P. The engines which are described as developing a H.P. to every 2 ½ to 3 ½ lbs. weight, will, 9 times out of 10, in actual practice weigh 5 or 6 lbs. as the catalogues or descriptions make no allowance for cooling, lubrication, balance-wheel etc.

Assuming that we are right in adopting this type of engine on account of its simplicity, reliability, and the fact that this is so universally used and understood, let us consider if there is a way of improving the engine aside from the use of better mate ir ri als and careful workmanship. I am satisfied that there is nothing more to be sought in the general system of lubriction, ignition, and carburation, but there is a chance for improvement in the valve action.

Valve ports or any unevenness of the interior of the combustion chamber are to be avoided. Valves on the side of the cylinder, which is a common construction, is bad because the explosion space is divided. The more compact this explosion space can be designed, the more perfect if the ignition and the combustion of the gases. Any protruding 48 edges or corners are also objectionable as they become red hot and cause pre-ignition of the incoming charge of gas which either decreases the efficiency of the engine or requires much more cooling than would be necessary with the best design.

In the new engine being built by the Curtiss Mfg. Co. the following design has been adopted. (See fig. I).

The advantage can readily be seen when it is compared with Fig.2, which is a common construction. The placing of the valves at an angle in the cylinder head not only makes a more perfect shape combustion chamber but also allows of the use of very large valves, which is generally known to be a most desirable point.

The two-cycle engine has its advantages, but does not equal the four-cycle when H.P. per lb. weight and fuel consumption are considered. One of the points of advantage claimed by the two-cycle school is the absence of valves which are a possible source of trouble in the four-cycle engine, especially the exhaust valves leaking from the becoming pitted by the excessive heat of the burnt gas passing out. This fault can however be entirely overcome by the use of cast-iron rims homogeneously welded to the valves. Cast-iron does not pit from heat and this type of valve can be run for years without regrinding. This overcomes the principal disadvantage of the four cycle as compared with the two.

Theoretically an explosion each revolution, as secured by the two cycle system, would give more power for the same size cylinder than an explosion every other revolution 49 as in the four cycle. But a part of the burnt gas always remains in the cylinder in the two cycle tape, and cuts down the mean effective pressure besides making the engine much more difficult to cool properly, not only from the fact that there is an explosion every revolution, but because of the imperfect combustion caused by the burnt gas mixing with the incoming charge; whereas in the four cycle the burnt gases are almost completely ejected by the exhaust stroke and the cylinder is given an opportunity to cool on the suction stroke.

The two cycle engine however has undergone great improvement in the last few years and there is a possibility of its yet equalling the four cycle in efficiency.

To sum up, I would recommend for flying-machines requiring 20–35 H.P. a four cylinder vertical water-cooled four cycle engine with a single float feed carbureter mechanically operated intake and exhaust valves in the head, force feed and splash lubrication and magneto ignition. For greater power an 8 cylinder with two sets of four cylinders set at an angle of 90° and with one of each set of connecting rods attached to the same crank, fitted with two carbureters, one for each set of cylinders, lubrication by both gear pump direct to bearings and splash, cylinders copper-jacketed, water-cooled, mechanically operated valves in the head actuated by single push rod and fitted with both magneto and battery ignition. G.H.C.

See blue print page 61.

50

COMBINATION FRONT CONTROL: By Gardiner H. Bell .

Feb. 26, 1909 :— Two levers running in a fore and aft direction and parallel to each other attached at or near their center to a strut or bar running perpendicular to said levers and on which they may turn freely with said bar or strut as an axis. Me an s for allowing said parallel levers to turn from right to left as well as to elevate and depress. These two levers support at their forward end a front control. Their opposite ends being grasped by the hand of the operator. As these levers are pivoted at or near their centers on above mentioned transverse strut or bar running perpendicular to said levers and in a lateral direction, in connection with the machine, this combination allows the operator to move said levers up or down elevating or depressing the front control. It also allows of a movement of the levers from right to left (the levers always keeping parallel to one another), and it also allows one lever to move up and the other down.

The three above mentioned combinations have the following effects:— (1) To elevate or depress the front control. The parallel levers are moved up or down simultaneously and to the same extent. This action steers the machine up or down as desired.

(2) Lateral stability is brought about by warping of the front control elevating one side and depressing the other, by moving one lever up and the other down.

51

The following case may explain more clearly the action brought about. Suppose the operator wishes to depress his machine on the port side and elevate it on the starboard side, he therefore depresses his right lever and elevates his left. At the control the action will be just the opposite, the right portion will be elevated, left portion depressed. Acting on the wind of advance the advancing angles displayed in this way should bring about the desired effect.

(3) Now horizontal steering to right or left by front control is brought about in this way: — In connection with the horizontal front control there is a vertical control pivoted to the horizontal control at the forward edges of both. The rear edge of the vertical rudder is fastened by means of two wires to the body so that it cannot be moved. Now by moving the levers from right to left the horizontal front control is moved in its own plane from left to right. The front margin of the vertical rudder being fastened to the front margin of the horizontal control is necessarily moved also. The rear margin being held stationary to the body of the machine does not move. In this way the wind of advance may be made to act one either side of the vertical control steering the machine to right or left at will.

G.H.B.

53 54 55 147555-T 56 147556-T 57 138662-A 138661-M

1909 FEB 22

58

by J N Davidson

By H M. Benson

59 130728-A Book III p 140

(c) H. M. Benner

60 H M Benner 138197-A B III p. 144 lov? Could use 138267-A 61

Fig 1.

Fig. 2

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXXV Issued MONDAY, MAR. 8, 1909

ASSOCIATION'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell Assistant Editor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO.XXXV ISSUED MONDAY MARCH 8, 1909 .

Beinn Bhreagh, Near Baddeck, Nova Scotia .

TABLE OF CONTENTS.

Feb.22, Bell to Associated Press 1–2

Feb.22, Bell to Halifax Herald 1–2

Feb.22, Bell to Baldwin 2–2

Feb.22, Bell to Fairchild 2–2

Feb.22, Bell to Grosvenor 2–2

Feb.22, Fairchild to Bell 2–2

Feb.22, Halifax Herald to Bell 2–2

Feb.23, Sydney Post to Bell 3–3

Feb.23, Bell to Sydney Post 3–3

Feb.23, London Times to Bell 3–3

Feb.23, Bell to London Times 4–4

Feb.23, Bell to Associated Press 5–5

Feb.23, Bell to Halifax Herald 5–6

Feb.23, Bell to Arthur W. McCurdy 6–6

Feb.23, Bell to Baldwin 6–6

Feb.23, Bell to Grosvenor 6–6

Feb.23, Bell to Fairchild 6–6

Feb.24, Bell to Associated Press 6–7

Feb.24, Bell to London Times 6–7

Feb.24, Bell to Sydney Post 6–7

Feb.24, Cox to Halifax Herald 7–7

Feb.24, Associated Press to Bell 8–8

Feb.24, Arthur W. McCurdy to Bell 8–8

Feb.24, Bell to Arthur W. McCurdy 8–8

Feb.24, Bell to Fairchild 8–8

Feb.24, Bell to Grosvenor 8–8

Feb.24, Bell to Baldwin 8–8

Feb.24, Bell to Post to Bell 8–8

Feb.24, Bell to Sydney Post 9–9

Feb.24, Bell to Associated Press 9–10

Feb.23, Mr. and Mrs. Grosvenor to Bell 10–10

Feb.24, Baldwin to Bell 10–10

Feb.25, Halifax Chronicle to Bell 11–11

Feb.26, Canadian Club of Victoria to McC 11–11

1

Telegrams .

Bell to Chas. S. Thompson (Associated Press, N.Y.) .

Baddeck, N.S., Feb. 22, 1909 :—Experiments were made on the ice here to-day with the new aerodrome built by the Aerial Experiment Association. This is officially known as “Drome No.5, Bell's Cygnet the second”. The machine was operated by Mr. J.A.D. McCurdy of Baddeck.

Cygnet II resembles very much in appearance Dr. Bell's tetrahedral kite, Cygnet the first, which in December 1907 successfully carried up i i n to the air the late Lieut. Selfridge then

Secretary of the Aerial Experiment Association, who was afterwards killed in the accident to Orville Wright's aerodrome at Fort Meyer.

Today— the first attempt was made to apply engine power to a tetrahedral structure. The machine had been provided with sledge-runners and an aerial propeller 10 feet in diameter driven by a 50 H.P. 8 cylinder water-cooled motor especially designed by Mr. Glenn H. Curtiss and built by the G. H. Curtiss Mfg. Co. of Hammondsport, New York. It contains 3690 tetrahedral winged cells and weighed 950 lbs. with man and engine on board.

Before the machine had gathered sufficient speed over the ice to get into the air the propeller shaft sheared, and the propeller was thrown violently upon the ice and broken. It will take a few days to make another propeller and in the meantime experiments will be made with Drome No.4, McCurdy's Silver-Dart. This machine has already made several 2 2 successful flights at Hammondsport, N.Y. and is the first flying machine to appear in Canada.

If weather conditions are favorable it is hoped that a flight may be made to-morrow.

(Signed) Graham Bell. (Above telegram was also sent to W.R. McCurdy of the Halifax Herald).

Bell to Fairchild, Grosvenor and Baldwin .

Baddeck, N.S., Feb. 22, 1909 :— McCurdy tried tetrahedral aerodrome Cygnet the second to-day. Propeller shaft sheared throwing propeller violently to the ice and breaking it. Will take few days to make a new propeller. Meantime will try McCurdy's Silver-Dart. First flight in Canada probably to-morrow.

(Signed) Graham Bell.

Fairchild to Bell .

Washington, D. C., Feb. 22, 1909 :— Confound the propeller. Wish you better luck next time. All well here.

(Signed) David.

McCurdy (Halifax Herald) to Bell.

Halifax, N.S., Feb. 22, 1909 :— Thanks for aerodrome dispatch. Glad to hear from you at any time.

(Signed) W.R. McCurdy.

3

3 Milton Brown (Sydney Post) to Bell .

Sydney, N.S., Feb. 23, 1909: — Have an old interview on airships you were kind enough to give me in 1906. New York papers asking for something. May I use it again.

(Signed) J. Milton Brown. City Editor of Daily Post.

Bell to Milton Brown (Sydney Post) .

Baddeck, Feb. 23, 1909 :— Old interview quite out of date. Newer things here now. Douglas McCurdy of Baddeck made a beautiful flight to-day in his aerodrome Silver-Dart, the 4th aerodrome built by the Aerial Experiment Association. This is the first flight of a flying-machine in Canada. A 50 H.P. engine was employed designed specially for the Association by Mr. G. H. Curtiss and built by the Curtiss Mfg. Co. of Hammondsport, N.Y. Half the town of Baddeck were on the ice to witness the event.

(Signed) Graham Bell.

Fred Cook (London Times Correspondent) to Bell .

Ottawa, Feb. 23, 1909 :— Shall be glad to be advised of the success of your aerodrome experiments. Wire at my expense.

(Signed) Fred Cooke London Times Correspondent.

4

Bell to Cooke (Correspondent London Times)

Baddeck, N.S., Feb. 23, 1909 :— The first flight of a flying machine in Canada occurred here to-day when Mr. Douglas McCurdy, a native of Baddeck, Nova Scotia, flew a distance of about one half mile, at an elevation of about 30 feet above the ice on Baddeck Bay in an aerodrome of his own design named the “Silver-Dart”. This is the fourth aerodrome built by the Aerial Experiment Association of which he is a member. The Association was organized in Halifax in October 1907 and has built five aerodromes.

Drome No.1, Selfridge's Red Wing; Drome No.2, Baldwin's White Wing; Drome No.3, Curtiss' June Bug; Drome No.4, McCurdy's Silver-Dart and Drome No.5, Bell's Cygnet the second.

No.5 is atetrahedral aerodrome designed by Dr. Alexander Graham Bell, the Chairman of the Association. It was tried for the first time yesterday but the ten-foot propeller used overloaded the engine, the propeller shaft sheared and the propeller was thrown off against the ice and broken. Some days will elapse before another propeller can be made and in the meantime the Association will carry on experiments with McCurdy's No.4, the Silver-Dart, at Baddeck.

(Signed) Graham Bell.

5

5 Bell to Chas. S. Thompson (Associated Press, N.Y.) .

Baddeck, N.S., Feb. 23, 1909 :— A successful flight of one half mile was made to-day at an elevation of from 20–30 feet over the ice at Baddeck, Nova Scotia, by Mr. Douglas McCurdy in his aerodrome the "Silver-Dart", the fourth aerodrome built by the Aerial Experiment Association.

It is worthy of notice that this seems to have been the first flight of a flying-machine in Canada. Half the town of Baddeck were on the ice to witness the event.

Kindly telegraph if you wish me to notify you of further developments.

(Signed) Graham Bell.

Bell to McCurdy (Halifax Herald) .

Baddeck, N.S., Feb. 23, 1909 :— The people of Baddeck, Nova Scotia, witnessed to-day the first flight of a flying-machine in Canada when Mr. Douglas McCurdy, himself a native of Baddeck, flew a distance of one-half mile over the ice in Baddeck Bay at an elevation of about 30 feet in an aerodrome of his own design named the "Silver-Dart". This is the fourth aerodrome built by the Aerial Experiment Association which was organized in Halifax in October 1907. Mr. McCurdy had previously made 14 flights in this aerodrome at Hammondsport, New York.

It was obvious from to-day's experiments that Mr. McCurdy could have flown to an indefinite distance so long as his engine power held out. He came down very gently on the ice after a short flight because he was getting rather 6 6 close to the shore and feared running into the land. Two little girls upon the ice had a narrow escape from being run over the machine when it came down but Mr. McCurdy was equal to the occasion and steered the machine gracefully to one side.

I have the names of over one hundred witnesses if you want them. Have sent a different telegram to Associated Press. Do you wish me to notify you of further developments here?

(Signed) Graham Bell.

Bell to Arthur McCurdy, Baldwin, Grosvenor & Fairchild .

Baddeck, N.S. Feb. 23, 1909: —Douglas flew one-half mile in the Silver-Dart to-day in great style. Half the town of Baddeck present.

(Signed) Graham Bell.

Bell to Chas R. Thompson (Associated Press, N.Y) .

Baddeck, N.S., Feb. 24, 1909: — The Aerial Experiment Association continued experiments this morning with Drome No.4, McCurdy's Silver-Dart.

Mr. McCurdy made a magnificent flight of 4 ½ miles at the rate of 40 miles an hour, circumnavigating, or rather circumdroming Baddeck Bay at an elevation of between 40 and 50 feet in the air. At one point he crossed a tongue of land going over a tree in his way. At the lower end of the Bay, finding himself too close to shore for a safe turn he shut off power and came down on the ice. One of the wings was broken during the landing and a wheel was injured by 7 skidding. It will take a day or two to repair damages.

(Signed) Graham Bell.

(The above telegram was also sent to Fred Cooke, Ottawa correspondent of the London Times and to Milton Brown, City Editor of the Sydney Daily Post).

Cox to McCurdy (Halifax Herald) .

Baddeck, N.S., Feb. 24, 1909 :— The Aerial Experiment Association continued their experiments on the ice in Baddeck Bay this morning. Ideal weather conditions prevailed and Mr. Douglas McCurdy, Secretary of the Association eclipsed all records of the

Association by flying four and a half miles at an elevation of between forty and fifty feet in the air, and turning a complete circle.

Mr. F.W. Baldwin, Chief Engineer of the Association, made the first public flight in America in Drome No.I, Selfridge's Red Wing.

Mr. G. H. Curtiss, the Association's Director of Experiments won the Scientific American Trophy on July 4 by flying over a measured kilometer in Drome No.3, Curtiss' June Bug.

Mr. McCurdy in his magnificent flight to-day had full control of the machine at all times, but in endeavoring to circle for the second time at the lower end of the Bay found himself pinched for room and therefore shut off power to avoid running into trees and landed. In doing so the machine skidded on the ice and broke some chords and struts in the starboard wing. A day will repair all damages.

Dr. Bell approves this telegram.

(Signed) Charles R. Cox, Private Secretary.

8

Thompson (Associated Press) to Bel l.

New York, Feb. 24, 1909 :— Thanks for message. Please continue sending developments.

(Signed) Charles S. Thompson.

Arthur W. McCurdy to Bell.

Victoria, B. X C ., Feb. 24, 1909 :— Many thanks for telegram. Hope Douglas will bring the world's record trophy to Canada.

Our papers here full of it.

(Signed) A.W. McCurdy.

Bell to A.W. McCurdy, Fairchild, Grosvenor & Baldwin .

Baddeck, Feb. 24, 1909 :—Douglas eclipsed all records of the Association this morning by circumnavigating, or rather circumdroming Baddeck Bay at a height of 40 or 50 feet. He went between four and five miles at forty miles an hour.

A magnificent performance.

(Signed) Graham Bell.

Milton Brown (Sydney Post) to Bell .

Sydney, Feb. 24, 1909:— What is world's record flight, and time heavier-than-air machine? When made by whom?

(Signed) Milton Brown, City Editor Sydney Post.

9

Bell to Milton Brown (Sydney Post) .

Baddeck, Feb. 24, 1909: — World's official record made by Wilbur Wright at Le Mans Dec. 31, 1908. Distance 77 ½ miles; time 2 hours, twenty minut c e s, twenty-three and one fifth seconds.

(Signed) Graham Bell.

Bell to Thompson (Associated Press) .

Baddeck, Feb. 24, 1909:— The following is a copy of minutes of meeting held in Baddeck this morning:—

Baddeck Center, Feb. 24th, 1909 :— At a meeting of the BOARD OF COMMISSIONERS FOR BADDECK CENTER, namely John E. Campbell, Kenneth J. McKay, and H. Percy Blanchard, convened this morning for the purpose, the following resolution was unanimously passed and ordered to be engrossed upon the minutes:—

WHEREAS the first flight of an airship within Canada was made successfully at Baddeck yesterday the twenty-third day of February in the year one thousand nine hundred and nine, an event of historic importance coupling as it will with the fact, the name of our worthy and honored citizen Dr. Graham Bell under whose auspices the flight was made, the name of the bold aeronaut Douglas McCurdy a Baddeck boy born and bred, and the name of our home Baddeck where this notable event took place:—

RESOLVED that these facts are well worthy of being recorded on our public records, and further resolved that 10 copies of this resolution be sent to Dr. Graham Bell and Mr. Douglas McCurdy with the congratulations of the village of Baddeck Center on their well merited success.

(Signed) Graham Bell.

The following telegrams received here are a little out of order:—

Mr. and Mrs. Grosvenor to Bell.

St. Augustine, Fla. Feb. 23, 1909: — Congratulations on splendid flight. We wish tetrahedral Cygnet equal success.

(Signed) Elbert.

Baldwin to Bell.

New York, Feb. 24, 1909 :— Thanks telegram congratulations. Saw interesting aerially propelled hydroplane feature.

(Signed) Casey.

11

Halifax Chronicle to Bell .

Halifax, N.S., Feb. 25, 1909 :— Owing to wide spread interest in your experiments the Morning Chronicle would be obliged if you would have telegraph ed at our expense daily reports of flights of Aerodrome.

(Signed) Morning Chronicle.

Canadian Club of Victoria to McCurdy .

Victoria, B.C. Feb. 26, 1909 :—Hearty congratulations of Canadian Club of Victoria on your splendid achievement in aerial navigation.

(Signed) Frank J. Clarke Secretary.

Baldwin to Bell .

Montreal, Feb. 28, 1909: — L ecture delivered successfully. Eleven Hundred students. Prostrated faculty completely collapsed. Attack Canadian Club to-morrow night.

(Signed) Casey.

Bell to Baldwin.

Baddeck, N.S., March 1, 1909 :— Having survived lecture you must now be in fine shape to tackle Canadian Club. Good luck to you. McCurdy's flight twenty-fourth was magnificent. Only sorry you and Kathleen not here.

(Signed) Graham Bell.

12

Hickey (Halifax Chronicle) to McCurdy.

Halifax, N.S., March 1, 1909:— New York Times requests me to ask you to kindly forward through me reports covering all aerial experiments.

(Signed) James Hickey Chronicle.

Baldwin to Bell .

Montreal, March 2, 1909 :— Record meeting Canadian Club. Very enthusiastic over first Canadian flight. Leaving Montreal twelve this morning.

(Signed) Casey.

Gooderham to McCurdy.

Toronto, March 2, 1909 :— Congratulations from Deancroft. Don't fly too high.

(Signed) A.E. Gooderham.

Curtiss to McCurdy .

New York, March 3, 1909 :— If square radiator don't cool put fan on engine fly wheel etc.

(Signed) G.H. Curtiss.

McCurd t y to Curtiss .

Baddeck, N.S., March 3, 1909 :— Square radiator cools O.K. Tried on ice-boat yeserday.

(Signed) J.A.D. McCurdy.

13

Bell to Milton Brown (Sydney Post) .

Baddeck, N.S., March 3, 1909 :— Must apologize for delay in answering your telegram. You are mistaken about Curtiss, and none of us have any intention of competing for the British Channel Race you refer to. The Association, as its name implies, is only for experimental purposes.

(Signed) Graham Bell.

Curtiss to McCurdy .

New York, N.Y., March 4, 1909 :—Bishop agrees for Cup Trial. Has written. Made He e r ring proposition which he verbally accepted. Took order for aeroplane from Aviation Society.

(Signed) G. H. Curtiss.

McCurdy to Curtiss .

Baddeck, N.S., March 4, 1909: — Telegram received. Arrange with officials for trial of Trophy as soon as possible. Telegraph reply.

(Signed) J.A.D. McCurdy.

14

BADDECK OFFERS CONGRATULATIONS .

Blanchard to Bell .

Baddeck, N.S., Feb. 24, 1909 :— A meeting of the Board of Commissioners for Baddeck Center was convened this morning pro re nata to take note of a remarkable event that happened in Baddeck yesterday to wit successful flight in Canada. This means a great deal for Baddeck. We cannot help but share in the fame of this event. We can at least express our appreciation and congratulations, as well as our admiration of the courage and nerve displayed by Mr. Douglas McCurdy.

Kindly permit us the liberty of enclosing you a copy of the resolution passed at the aforesaid meeting.

(Signed) H. Percy Blanchard Sec. Board of Com.

Blanchard to McCurdy .

Baddeck, N.S., Feb. 24, 1909:— A meeting of the Board of Commissioners for Baddeck Center was convened this morning pro re nata to take note of a remarkable event that happened in Baddeck yesterday to wit successful flight in Canada.

Please accept a copy of the enclosed resolution with best wishes and congratulations.

(Signed) H. Percy Blanchard, Sec. Board of Com.

15

Resolution of Board of Commissioners enclosed by Mr. Blanchard.

Baddeck Center, Feb. 24, 1909 :— At a Meeting of the BOARD OF COMMISSIONERS FOR BADDECK CENTER, namely, John E. Campbell, Kenneth J. McKay, and H. Percy Blanchard, convened this morn n i ng for the purpose, the following resolution was unanimously passed and ordered to be engrossed upon the Minutes:—

WHEREAS the first flight of an airship within Canada was made successfully at Baddeck yesterday the twenty-third day of February, in the year one thousand nine hundred and nine, an event of historic importance coupling as it will with the fact, the name of our worthy and honored citizen Dr. Graham Bell, under whoseauspices the flight was made, the name of the bold aeronaut Douglas McCurdy a Baddeck boy born and bred, and the name of our home Baddeck where this notable event took place,

RESOLVED that these facts are well worthy of being recorded on our public records, and further resolved that copies of this resolution be sent to Dr. Graham Bell, and Mr. Douglas McCurdy with the congratulations of the Village of Baddeck Center on their well merited success.

Certified copy of minutes,

(Signed) H. Percy Blanchard, Sec. of Board.

16

McCurdy to Blanchard .

Beinn, Bhreagh, Feb. 26, 1909 :— It is indeed a great pleasure to me to realize that Baddeck, by a formal meeting of its Board of Trade, has expressed the feeling that its citizens appreciate the fact that the first flight of a flying-machine in Canada occurred at Baddeck.

That I had the honor to be the aviator of the Silver-Dart is due to the great kindness of Dr. Alexander Graham Bell whose untiring efforts to advance the science of the art of Aviation will, I feel sure, bring great credit and honor to our Canadian Dominion.

(Signed) J.A. Douglas McCurdy.

Bell to Blanchard .

Beinn Bhreagh March 3, 1909 :— I must apologize for my delay in ackno o w ledging receipt of your kind note of Feb. 24, enclosing resolution of the Board of Commissioners of Baddeck Center relating to Mr. Douglas McCurdy's successful flight in the Silver-Dart on the 23rd of Feb.

It is very gratifying to me, and to all those associated with me, that the citizens of Baddeck should have recognized the historical importance of that experiment. It is also gratifying to me that the machine which made this flight was constructed after the plans of a Baddeck man, and tried by a Baddeck man, at Baddeck itself.

This may seem to be a small matter at the present moment; but when flying-machines have become common, and

18

WITNESSES OF McCURDY'S FIRST FLIGHT IN THE SILVER-DART ON BADDECK BAY, FEB. 23, 1909.

(Compiled by Mr. Alec. MacDonald).

Anderson Miss Annie

Anderson Miss Emeline

Archibald Mr John

Arsenault Miss Esther

Arsenault Mr John

Bedwin Mr Wm F

Bell Dr A Graham

Bell Mrs A Graham

Bell Mr Gardiner H

Benner Mr H M

Bethune Mrs John L

Bethune Mr Gordon

Bethune Mr Norman

Bingay Mr A

Blanchard Mr H P

Bowers Mr Willie

Burke Mr Sanford

Byrnes Mr Charles

Byrnes Mrs Charles

Byrnes Mr Tom

Cadell Miss Inez

Campbell Mr Bert

Campbell Mr Dan

Campbell Mr John

Campbell Mr John E

Campbell Miss Lena

Campbell Miss Maggie

Campbell Mr S C

Campbell Miss Susie

Cox Mr Chas R

Crocker Miss Elizabeth

Crocker Miss Nellie

Crowdis Miss Frances

Crowdis Miss Louise

Crowdis Mrs M

Curtiss Mr G H

Curtiss Mrs G H

Davidson Mr John G

Dunlop Mr Graham

Dunlop Mr J G

Dunlop Mrs J G

Ferguson Mr Angus

Ferguson Mr Angus Jr

Ferguson Mr Murdock

Franks Mr Richard

Fraser Mr James

Fraser Mrs James

Fraser Mr Douglas

Fraser Mr Harry

Hart Mr Joseph

Hutchinson Mr Dan

Ingraham Mr K

Ingraham Mrs K

Insddor Mr George

Irving Mr J A

Kidston Miss Jennie

Keily Mr John

Keily Miss Sarah

McAskill Mr E G

McAskill Mrs E G

McAskill Miss Marguerite

McAulay Mr D W

McAulay Mr Farquhar

McAulay Mr Ian

McAulay Mr Murdock

McAulay Mr Peter

McCurdy Mr J A D

McCurdy Miss Mabel B

McDermid Mr John

McDermid Mr Neil

McDonald Mr Angus J

McDonald Mrs Angus J

McDonald Miss Annie

McDonald Mr A S

McDonald Mr Dan

McDonald Mr D M

McDonald Mr Donald

McDonald Mr Dougald

McDonald Mr Ian

McDonald Mr John

McDonald Mr Murdock

McDonald Mr R S

McDonald Miss Ruth

McDonald Mr S

McDonald Miss Sarah

McDonald Mr Stanley

McFarlan Mr John

McFarlan Mr M

McFarlan Mr P L

McIntosh Rev C C

McIntosh Mrs C C

McIver Dr

McIver Mr John

McIver Mrs N A

McIver Mr Philip

McKay Mr Edward

McKay Mrs Edward

McKay Miss Fanny

McKay Mr Floyd

19

2 McKay Mr John

McKay Mrs K J

McKay Mr Wilson

McKenzie Mr Charles

McKenzie Mr John

McKillop Mr A M

McLean Mr J

McLean Mr John

McLean Mrs John

McLean Mr M C

McLean Mr Michael

McLean Mr R J

McLean Mr Stephen

McLean Miss Tena

McLennan Mr Fred

McLeod Miss Agnes

McLeod Mr Daniel

McLeod Mr James

McLeod Mr John

McLeod Mrs M

McLeod Mr M G

McLeod Mr Philip

McLeod Mr William

McNeil Mr Alec

McNeil Mr Daniel

McNeil Mr Hector P

McNeil Mr John D

McNeil Mr P B

McPherson Mr Robert

McRae Mr Alec

McRae Rev D

McRae Mrs D

McRae Mr Kenzie

Manuel Mr James

Manuel Mr Rod

Morrison Mr Dan

Morrison Mr Dan J

Oram Mr Charles

Ross Mr A

Rudderham Mr W E

Smith Mr Duncan

Stewart Mr W

Sutherland Mr A H

Taylor Mr Alec

Thompson Mr E A

Watson Mr Bobby

Watson Miss Mary

Watson Mr R

20

THE AERIAL EXPERIMENT ASSOCIATION AT BADDECK, NOVA SCOTIA. By Chas. R. Cox. (Special despatch to the Washington Star).

Trial of Alexander Graham Bell's Cygnet II, and Mr. J.A.D. McCurdy's Silver-Dart; both machines installed with the G.H. Curtiss new 50 Horse-Power, 8 cylinder water-cooled motor. Large crowd witnesses the experiments.

The Aerial Experiment Association which was organized October, 1, 1907 at Halifax, Nova Scotia, and who have been experimenting for the last eight months at Hammondsport, New York, have finally taken up their headquarters at Beinn Bhreagh, Near Baddeck, Nova Scotia, to continue their experiments with their heavier-than-air machines on the ice in Baddeck Bay.

The Association at the present time is composed of Dr. Alexander Graham Bell of Washington, D.C., Chairman, Mr. G.H. Curtiss of Hammondsport, New York, Director of Experiments, and Mr. F.W. Baldwin and Mr. J.A.D. McCurdy of Baddeck, Engineers. The fifth member was the late Lieut. Thomas E. Selfridge, of the U.S. Army, who was killed at Fort Meyer in the accident to Orville Wright's machine.

On Monday, Feb. 22, word was passed around the town of Baddeck that the Association was going to try for the first time their aerodrome No.5, Bell's Cygnet II, and before three o'clock in the afternoon, which was the time set for the trial crowds had gathered on the ice from all places in and around the county.

Ideal weather conditions prevailed and about 2.45 the magnificent bird-like structure (Bell's Cygnet II) was taken 21 2 from its large aerodrome shed and pushed on its sledge-runners on the ice out in Baddeck Bay. The minute she made her appearance on the lower Bay it seemed as if everyone had a camera, and for a few minutes everyone was taking pictures. A few preliminary touches had to be made on the machine when finally she was placed facing the wind and the engine started. Quickly did this large man-carrying structure speed along the ice, but it was evident that she was not making the necessary speed required to lift her from the ice, and the aviator, Mr. J.A.D. McCurdy, Secretary of the Association, shut off power. Something was wrong with the engine, and upon examination it was found that one of the pipes leading from the gasoline tank was broken. This was easily repaired in about five minutes, and again the machine was started once more into the wind. Just when she was making a good speed and everyone was looking for her to rise into the air a great crash was heard something like an explosion and the propeller was hurled violently to the ice smashing in three pieces. At this very moment to the onlooker it was hard to realize what was the matter until finally hundreds of people were seen scrambling for souvenirs from the broken propeller which was some twenty feet away from where the machine had stopped.

It was here evident to the members of the Association that the ten-foot propeller used was too much for the engine and the explosion that was heard was not from any defect in the engine, but from the sudden snapping off of the propelle: 22 3 shaft.

It was decided to take the machine to the aerodrome shed to repair the shaft and to make a new propeller of smaller diameter. Everyone seemed to be well satisfied with the first attempt at a flight of a heavier-than-air machine in Canada, and it was announced that weather conditions being favorable a flight would be made the next afternoon with Drome No.4, McCurdy's Silver-Dart.

MCCURDY'S FLIGHT IN THE SILVER-DART.

On Tuesday, Feb. 23, the Aerial Experiment Association continued their experiments. About one o'clock hardly any wind was noticed, and like the previous day the weather was fine and even a greater crowd than the day before had assembled on the ice to witness the experiments. About three o'clock the Silver-Dart was wheeled from her shed to the outer Bay and placed in a position about a mile from the Beinn Bhreagh Shore facing the wind. Mr. McCurdy took the aviator's seat. Crowds at this time began to congregate in front of the machine and along the line of advance of the machine until it became obvious that it would be necessary to appoint police in order to keep the ice clear thereby avoiding accident. Just as the machine was about to be started the wind shifted from the south-east to the north-east, and it was decided to take the machine further up the Bay and start flying towards the Beinn Bhreagh Shore. As most of the Laboratory Staff were on skates this was done very quickly and before some of the people could realize what was taking place the buzz of the engine could be heard in the distance and the 23 4 machine was seen rapidly advancing along the ice. She had gone about 90 feet along the ice when all of a sudden she rose gracefully into the air to an elevation of about 20 to 30 feet, and was traveling at about the rate of 40 miles an hour. Everyone seemed dumb-founded and before they could realize that they had actually witnessed the first flight of a heavier-than-air machine in Canada, Mr. McCurdy was compelled to shut off his power and glide to the ground owing to the long stretch of land and trees in front of him. Just as he was about 10 feet from the ground he noticed two little girls skating in front of the machine, and if it wasn't for his presence of mind, and his complete control of the machine a serious accident might have occurred. Gracefully did he steer to one side of them making a beautiful landing on the ice. It was evident to the observers of this experiment that Mr. McCurdy could have flown for an indefinite time as the engine and machine were working beautifully, and it was only a question of how much fuel he had as to how long he would remain in the air.

Everybody rushed to congratulate the young aviator, and he promised them that he would even do better the next day if the weather conditions were good.

McCURDY'S SECOND FLIGHT IN THE SILVER-DART.

Wednesday, Feb. 24, was another ideal day for flying, and the members of the Aerial Association thought they would make two flights to-day instead of one, and therefore set the hour for twelve o'clock for the first flight. It now became obvious that the whole country had become flying-machine 24 5 machine crazy, and it seemed no matter what time a flight would be started the people would be on hand to witness it.

About 12.30 the machine was wheeled on to the ice about in the same position she was placed for her first trial the day before (the wind being south-west). The Laboratory Staff all held on to the machine while Mr. G. H. Curtiss gave her one test before the ascension. Finally the power was shut off and every preparation was made for a fairly long flight, or at least until a complete circle was made which would mean about 2 ½ miles in diameter.

The engine was started and away went the Silver-Dart over the ice for about 90 feet when she rose gracefully into the air as the day before. But this time Mr. McCurdy had a clear space in front of him for at least two miles and well did he take advantage of it. He flew for about a mile in a straight course, then taking a wide circle of about # of a mile and came along the other shore at an elevation of about 50 feet in the air at the rate of about 40 miles an hour. When he was making the turn the people on the opposite shore in their teams did not know what to do when they saw this “wizard” coming their way as some of them exclaimed. One man completely lost his head and drove directly under the machine which went over him like a shot; other people were running for the beach; but away sped the Silver-Dart over teams, over peoples heads, over trees, and over a large tongue of land, and was making for the lower end of the Bay for its second turn when Mr. McCurdy saw at a glance that the place was too narrow at this end of the Bay and that he had better shut off power 25 and glide to the ice. This he did, and landed covering a distance of 4

½ miles. In landing one of the wings skidded on the ice and was damaged slightly, and one of the front wheels was bent. Mr. McCurdy had flown so far in such a short time that it was about five minutes before the fastest horse on the ice could get to where he had landed, and it was about an hour before all the people could get to him to congratulate him upon his magnificent flight, the longest ever made by any member of the Aerial Experiment Association, and one of the prettiest that has ever been made by any aviator in the world.

Weather conditions were unsatisfactory for a flight to-day and the Laboratory Staff will take the opportunity of adjusting a few minor details on the Silver-Dart in order that they might have her ready for daily experiments.

C.R.C.

26

DR. ALEXANDER GRAHAM BELL ADDS ANOTHER LAUREL TO CANADA: By J.G. Davidson, a special despatch to Canadian Newspaper.

Baddeck, C.B :— And again the eyes of the world will be directed towards Baddeck, and no doubt but to some the map of Canada will be scanned to locate that already far famed summer resort situated as it is “Romantic”, on the shores of the Bras d'Or Lakes; and near by on a prominent peninsula and high mountain, already conspicuous by a Tower on top built of tetrahedral construction, is the estate and summer home of the world famed Scientist and Inventor, Dr. Alexander Graham Bell.

To-day the foremost thing with the powers of the world is navigation of the air, either by balloon or heavier-than-air machine. And to this end the veteran scientist, although now over three score years, is as enthusiastic towards solving the problem as the younger race of to-day. A little over a year ago Dr. Bell, having some young talent in connection with his Laboratory seemingly interested with him in Aviation, formed an Association now known as the “Aerial Experiment Association” of which Dr. Bell is Chairman.

The first success of the Association was on December 6, 1907, when Dr. Bell's Cygnet of tetrahedral construction carried one of the members, the late Lieut. Selfridge, gracefully in the air to a height of 165 feet and descended as gracefully as it ascended. The Association then moved its headquarters to Hammondsport, N.Y., for the winter to carry on further experiments at or near the works of the already famed Curtiss Motor Cycle Factory. The members, then combining 27 2 their ideas, each in succession built a heavier-than-air machine namely, Selfridge's “Red Wing”, Baldwin's “White Wing”, Curtiss' “June Bug”, and McCurdy's “Silver-Dart” all of which made successful flights, and on July 4, 1908, Curtiss with his “June Bug” captured the Scientific American Trophy for the first heavier-than-air machine to fly one kilometer. This was another victory for Dr. Bell as it was the first public flight made in America. Then Mr. McCurdy built his “Silver-Dart”and made several flights at Hammondsport. It was then shipped to Baddeck, when we come to the present day. On Feb. 23, Mr. McCurdy made the first flight that has been made in Canada over the ice on the Bras d'Or Lakes and, although Dr. Bell made no public announcement that they were to make a flight, word reached Baddeck and surrounding districts, and the ice being in perfect condition about the whole townspeople of Baddeck, old and young, were swarming to the scene on skates and sleighs, and from all other directions was a moving mass of people and horses. Some men up in the seventies whom the writer talked with and who had not had skates on for years could not resist putting them on as the fastest means of getting to the scene after they had heard the news.

People were awe stricken and looked on even with their mouths open when the machine soared through the air and in much better control than were the eye witnesses and descended as gracefully as a bird.

Feb. 24, Mr. McCurdy made another flight making a complete circle of fully four and a half miles and it will be a memorable day to old and young who witnessed the event. 28 3 Here comes honor to whom honor is due. Dr. Bell is a Scotch-man by birth, America claims him by adoption although he spends the greater part of the year in Canada. Canada to-day ought to be proud and is proud of Dr. Alexander Graham Bell.

Canada to-day claims the inventor of the world's domestic telephone; Canada to-day claims the first flight with heavier-than-air machine through Dr. Bell. Canada is not slow. She has already demonstrated to the world the recognition of her telephone inventor by purchasing for a public park the old Bell Homestead in Brantford and to erect a monument while the inventor is still alive and can appreciate the tribute paid him by the people of Canada. And Baddeck claims by birth the first aerial navigator in Canada in J.A.D. McCurdy, a young man little over a year from Toronto University where he finished his course in Engineering and today has made more public flights, barring the ? W right Brothers than any man in America. A nice genial, cool-headed, free and easy young man and a man who no doubt at no distant date will attract the eyes of the world further. Baddeck no doubt is proud of one of its sons who, when a boy after school hours, spent considerable time yachting on the Bras d'Or Lakes; and few could handle a yacht better than Douglas McCurdy and to-day it looks as i ? f it were less trouble for him to navigate the air than the sails. It is the sincere wish of all his friends that he may have a long and useful career ahead of him in Aviation. J.G.D.

29

Blanchard to McCurdy .

Baddeck, N.S., Feb. 25, 1909 :— Will you be offended if I make a few suggestions regarding the big Cygnet?

The first is, polish the runners to a shine. If my experience with coasting sleds and double runners is at all in point, I would say there would be a difference of 25% in favor of a polished runner, and the difference is fully as marked on ice as on snow. Now of course I don't have to tell you that if it requires a speed of say 25 miles in still air to get sustaining power fo ? r the Cygnet, that if the angle of elevation is the same while the machine is resting on the ice as it is to take when pursuing a horizontal course through the air that it will take not only the power sufficient to fly the “drome” to propel it up to this speed but also enough to overcome the friction on the ice. Say this latter friction requires 15 H.P. and to overcome the air friction on the cells 40 H.P. that means 55 H.P. But suppose you only have 50 H.P. you cannot get up the initial velocity, and so cannot fly. If now, you could reduce your head friction until you had then this initial velocity, then by throwing up your wings to the proper angle and your rudder accordingly as you well know how, you rise, and have 10 H.P. to the good once you are in the air.

My suggestion would be, for ICE use a much better skate like the ice-boat and have a front steering skate moving in unison with your perpendicular rudder.

30

2 As to the hind skates have them at the end of arms or levers and then at the proper moment release a grip and let the rear of the “Drome” fall down . Of course to hoist the front would be preferable but that calls for too much strength.

The theory is that with an almost horizontal position of the aeroplanes while getting your speed on the ice only skin atmospheric friction is developed plus skate friction.

You will notice that in the sketch, the skate is part of the “hind leg”. As the adage reads on the back of the sheet music, “Try this over on your piano”.

You won't mind these few suggestions. If they don't commend themselves to you, just put them down to an old man's foolishness.

(Signed) H. Percy Blanchard.

31

THE SELFRIDGE MEMORIAL .

Lahm to Curtiss .

Wshington, D.C., Feb. 23, 1909:— I received your letter of Feb. 11 with Mrs. Bell's paper with suggestions for the Memorial. After taking the matter into consideration, I have decided that she has hit the nail on the head and we are indebted to her for an excellent idea.

At West Point there is a large building, called Cullom Memorial Hall, built for the purpose of commemorating officers, wars, battles, regiments etc. In it are many tablets set in the walls of the different rooms, each one to the memory of an officer who has been killed since ninety-eight. One to Selfridge would be most app ?? ro priate among them. I have written to West Point on the subject, and will let you know as soon as I find out more about it. As a matter of fact, I believe we can well do more than this. Possibly we can also set up a larger memorial in the shape of a tablet raised somewhat above the ground at Fort Meyer as Mrs. Bell suggests. I could be something not too elaborate but at the same time a fitting reminder near the place where the trials took place, but not on the drill ground.

I have talked with a monument man here relative to the last scheme, and find it can be done very easily for a reasonable amount.

(Signed) Frank P Lahm.

32

CORRESPONDENCE ABOUT THE DEFINITION OF THE WORD “AERODROME”.

Jones to Bell .

New York, Feb. 20, 1909 :— Enclosed please find definitions of the words “aerodrome” and “aerodromics”, and I have written Funk & Wagnalls as per the enlosed copy.

(Signed) E.L. Jones

Funk & Wagnalls to Jones .

New York, Feb. 17, 1909 :— Replying to your enquiry I take pleasure in giving you the definitions of the terms "Aerodrome" and "Aerodromics" as printed in the Standard Dictionary.

"Aerodrome , n. A machine for gliding on the air, consisting of supporting surfaces, means for propulsion and other adjuncts".

I give also the etymology of aerodrome for your guidance if needed. Gr. , combining form of air, the atmosphere, a running, from run.

" Aerodromics, n. The art of gliding on the air by means of an aerodrome".

Trusting that this information may prove useful to you, we remain, Very truly yours, (Signed) Funk & Wagnalls Co. Per Frank (something) Lexicographer.

Jones to Funk & Wagnalls .

New York, Feb. 20, 1909 :—Please accept thanks for your letter of Feb. 17.The definitions you enclose exactly coincide with 33 2 the opinion held, until lately, by Dr. A. Graham Bell.

While at Hammondsport one evening, we were talking over the etymology of aeronautical terms and subsequently Dr. Bell studied up the greek words and decided that "Aerodromics" might properly be defined as "travel" through the air" and the word "Aerodrome" to apply to a course over which flying machines and airships might race.

The word "Aerodrome" is popularly used now to designate grounds where flying machines and airships are tried out or raced. For instance, the Morris Park Race Track in New York City leased by the Aeronautic Society. This definition has come into use by comparison with the word "hippodrome" which means a place where horses are exercised and raced. The two words seem to be analogous.

Another, but incorrect use of the word “Aerodrome” is a shed or building housing flying machines or airships. This is in use particularly in France.

The word “Aerodrome”, meaning the machine, defined as per your letter, was put into practice by Langley who called his steam model an “Aerodrome”, and the word “Aerodromics” was the name he gave to the art of flying by his machine.

Inasmuch as the International Aeronautical Federation adopted, last year, a set of words covering the Art, I hope that the next edition of the dictionary will give correct definitions of all the terms to this new Art.

In this magazine, we are using the word “Aerodromics” as meaning “Travel through the air” and motor aerodromics” as 34 “travel through the air with a self contained power plant”.

I forward your very kind letter to Dr. Bell for his information.

(Signed) E.L. Jones.

Bell to Funk & Wagnalls .

Baddeck, N.S., March 2, 1909 :— I am glad to note from your letter to Mr. Ernest La Rue Jones, dated Feb. 17, 1909, that the Standard Dictionary defines the word “Aerodrome” as follows:—

“ Aerodrome , n. A mechanism for gliding on the air, consisting of supporting surfaces, means for propulsiion, and other adjuncts”.

This is exactly the sense in which I have always used the term; and was also, I believe, the meaning assigned to it by the late Prof. Langley.

I have been publicly criticized for applying the term to the flying machine itself, instead of to the shed or building in which it is housed, a meaning that has lately been introduced into this country from France, and which appears to me to be incorrect. This meaning has been defended on the ground of analogy to “hippodr e o me”; but the analogy is not correct, for a hippodrome is not a place where horses are simply housed or kept (a stable) but a place where they are run.

It has recently been proposed to use the term “aerodrome” to designate the grounds where flying machines and dirigible balloons are run or raced. This meaning, although less objectionable than the application to the building where the machines are stored, seems to me inappropriate for the 35 4 “race track” of the flying machine is the air itself and not the ground.

Fortified by the definition in the Standard Dictionary I shall continue to use the word “aerodrome” for the flying machine itself until such time as some other meaning has been authoritatively defined. At present I believe that the word is not to be found in any dictionary excepting in this sense.

In order to avoid the awkwardness of using the word in three distinct meanings I shall speak of “Aerodrome-track” (or “Aerodrome-park) for the place where aerodromes are exhibited and raced; and “Aerodrome-shed” (analogous to balloon-shed) for the building in which they are housed. It would be unfortunate, I think to use in this connection the word “Aerodrome” alone, as it has already an established meaning in the sense of the machine.

The members of the Aerial Experiment Association, of which I am Chairman, have become so accustomed to this meaning of the word “Aerodrome”, that we habitually abbreviate it to “Drome”; and speak of our flying machines as Drome No.I, Drome No.2 etc. We are even beginning to use the contraction as a verb (to drome, droming etc); and I notice that the newspapers the other day, in referring to Mr. McCurdy's recent flight in the aerodrome “Silver-Dart”, spoke of him as “circumnavigating or rather circumdro in mi ng Baddeck Bay”.

I enclose for your information a communication I made to the members of the Aerial Experiment Association, Dec. 29, 1908, entitled “An Important Conference at Hammondsport” which 36 5 shows the origin of the discussion now going on in regard to the meaning to be assigned to the word “Aerodrome”.

(Signed) Alexander Graham Bell.

The paper referred to “An Important Conference at Hammondsport”, has already been given in Bulletin XXVI pp 9–11.

37

THE OUTLOOK ON AVIATION: By the Secretary.

In going over the newspaper clippings one cannot help being struck by the fact that a great mjaority of them deals with reports concerning the doings of the Wright Brothers. The French as a nation have decided to recognize the Wright Brothers by conferring on them the order of the Legion of Honor, the highest honor that the French Republic can confer. This action of the French Government was decided on some considerable time ago but when Wilbur was approached on the subject he is reported to have said, “wait for Orville we have done our work together, and I cannot take an honor apart from him”.

An invitation has also been extended to the Wright Brothers to come to London at the end of March when they will be given the gold medal of the Aeronautical Association. This invitation has been accepted by the Wright Brothers. That England is alive to the fact that the Wrights are perhaps the most expert of aviators is shown by the report that on the floor of the House of Commons on Feb. 23, the Secretary of War Haldane announced that the Government was considering the advisability of trying to secure the services of the Wright Brothers, the American aeroplanists of Dayton, Ohio, and their aeroplanes.

On Feb. 15 Miss Katherine Wright made her first ascension and flight in her brothers' aeroplane with Wilbur acting as operator.

38

2 Although Mr. Wilbur Wright is reported to have admitted that he fears it will be always necessary to carry about the apparatus by which the aeroplane is enabled to get started on his flight still a note in L'Aerophile which we will quote, points out that such may not be the case.

“ A new way of Departure: — Until now, at Pau as at Mans, Wilbur Wright has used, for starting, the weights falling from the staging and the rail for launching. Next week he is going to try to start from wheels attached to the frame of the aeroplane.”

A new motor manufactured in France has been installed in the Wright aeroplane from which great results as to speed, efficiency etc. are expected.

Strong efforts are being made by the Aero Club of America to induce Wilbur Wright to represent the United States in the first International Aviation race this year in Paris for the Silver C up by James Gordon-Bennet. The winner will also receive a cash prize of $5000 and additional trophies are to be offered. Wilbur Wright has thus far declined to allow his name to be used as a probable competitor but an earnest request was sent to him last week by the Directors of the Aero Club of America to reconsider his decision. The United States will do everything they can to have a representative in the first International Aviation Contest.

A race which is attracting much interest is the contest to be held at Monaco and which is open until March 24. Contestants are required to start from the Quay at Monte Carlo 39 39 fly over the sea to Cape Martin, turn around the red and white flag and return to the starting point. The length of this flight is little more than six miles. The added time made by the contestant during his three best trips will constitute his official time. Many eminent aviators have entered as contestants in this race including Farman, Delagrange and others.

Major Baden-Powell the British authority for Aeronautics, believes that the time for legislation governing the use of airships is ripe. In a letter to the London Times he says:—

"***We are now confronted with the most intricate and difficult question of International politics one which, in the future, is bound to lead to complications and controversies. ***The first and one of the most important questions calling for solution is that regarding international frontiers seeing that neither walls nor fences, mountains nor rivers, not even seas offer insurmountable barriers. Secondly, there is the very serious question of private boundaries. ***If definite laws are adopted controlling such matters we then get to the still more perplexing problem of how to police these realms of blue. It is all very well to dictate regulations for aerial travel but how is the law to be maintained. Who can deny that such problems will demand our most earnest attention in the near future and they must be considered while there is yet time".***

A report is current in the American papers which states that Mr. A.M. Herring of New York has received an offer from three syndicates representing Germany, France and Belgium respectively offering him $100,000 to leave the United States and give them exclusive rights in their country 40 4 to manufacture his flying machine. Mr. Herring says he has almost decided to accept one of these offers in which case he would return here in June to fulfil his contract with this Government.

Mr. F.W. Baldwin of the Aerial Experiment Association delivered on Feb. 27 before the University of Toronto a lecture on Aviation. The popularity of the subject chosen and of the lecturer himself was clearly shown by the fact that immediately an invitation was extended to Mr. Baldwin by the Canadian Club of Toronto to lecture before that body on the following Monday, March 1.

The Aerial Experiment Association's Drome No. 5, Bell's Cygnet II was given its initial trial over the ice on Baddeck Bay on February 22. The shearing of her propeller shaft brought this experiment to an end.

Feb. 23 marks the date of the first flight of a flying machine in Canada. Drome No. 4, McCurdy's Silver-Dart flew a distance of one-half mile at an elevation of 20–30 ft. at Baddeck. On the 24th the Silver-Dart flew a distance of 4 ½ miles circumdroming Baddeck Bay. In the afternoon of the same day Cygnet II was again tried and the results obtained were encouraging. J.A.D. McC.

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXXVI Issued MONDAY, MAR. 15, 1909

ASSOCIATION'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell Assistant Editor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO.XXXVI ISSUED MONDAY MARCH 15, 1909 .

Beinn Bhreagh, Near Baddeck, Nova Scotia .

TABLE OF CONTENTS .

1

EDITORIAL NOTES AND COMMENTS .

Cygnet II .

Feb. 26, 1909 :— During the last experiment with Drome No.5, Bell's Cygnet II, a guy wire snapped just when it was beginning to look probable that the machine would take the air. This shows that there was considerable tensional strain in the machine at the time resulting from an attempt on the part of the Cygnet II to rise. What lessons can we learn from this fact?

(1) We must suspend the apparatus so as to support the load by tensional strain to be sure that the framework and guy wires are sufficient for the purpose. It would certainly not be a creditable thing to have the body of the machine drop out while in the air one guy wire

after another breaking like the first. We must be sure by actual trial that the machine is strong enough to sustain the body by suspension from the upper truss.

(2) It would be well also to examine the machine to see whether the long sledge runners do not oppose a resistance to turning up at the bow on account of their prolongation behind the center of gravity which lies about 15 cm in front of the center of surface. Might it not be well to allow the sledge runners to terminate at a point under the center of surface or to slope upwards from that point to the rear. In fact make the rear part of the sledge runners a sort of rocker upon which the machine could turn when the front control is raised. I rather think that the resistance to turning upwards at the bow produced by an unnecessary prolongation of the sledge runners at the rear must introduce an element interfering with the rise of the machine into the air. A.G.B.

2

OUTLINE OF WORK FOR MARCH 1909 .

March 1, 1909 :— The first of March has come and we have only one month to complete whatever experiments we have to do. In order to economize our time we should clearly place before us what is most important and what is of only secondary value.

The Association started out with the intention of testing a machine of pure tetrahedral construction in the air propelled by its own motive power and carrying a man.

Preliminary to this desired experiment we put up the tetrahedral kite Cygnet I with Lieut. Selfridge on board. Unfortunately, after completing successfully this preliminary experiment, the kite was wrecked by being dragged through the water by the Blue Hill. This was in December 1907; and not having another large structure of similar kind, nor materials wherewith to make it in shortime we adjourned the Association to Hammondsport and carried on an entirely different series of experiments while material was being made at Beinn Bhreagh for another Cygnet. Mrs. Bell's illness prevented our return to Beinn Bhreagh till quite late in 1908, and permitted of the manufacture of four aerodromes, upon a different plan from the Cygnet at Hammondsport.

As soon as I could get back to Beinn Bhreagh the new Cygnet II was commenced. It has been substantially completed for a long time, but we were still further delayed by the non-arrival of the engine from Hammondsport, and when at last it arrived it was found to be too heavy for the intended 3 purpose of being sent aloft in the Cygnet II flown as a kite after the manner of Cygnet I, and the season was so far advanced when it arrived that the Steamer Blue Hill was frozen in at her wharf in Baddeck. Only one month more remains to the Association for experimental work, and the only possible way of testing the Cygnet II now is to start it upon the ice.

We did so at the first possible moment after the arrival of the engine and on Feb. 22 we made our first preliminary experiment when the 10 ft. propeller provided was broken.

Another experiment made with the Silver-Dart propeller instead of one suited to the Cygnet structure was made Feb. 24, but on the snapping of a guy wire, McCurdy shut off power, and as it was then beginning to become dark it was thought best to postpone further experiments to another day.

(1) I think then that our first effort should be to complete our tests with the Cygnet II, and make every attempt to get her into the air if it is possible to do so considering the great weight of the structure with the man and engine on board. This should be our primary object for the short time remaining to us and every thing else should be made secondary to this.

It must be obvious to us all that we can put a structure of pure tetrahedral construction into the air with a man and engine on board; and until this is done the experiment which started the Association has not been completed.

4

3 This experiment blocks the way to further advance with tetrahedral structures. I have always been anxious to try an aerodrome built upon the Oionos plan but have purposely postponed any such trial until after we have tested thoro g u ghly the stability of aerodromes of pure tetrahedral form in which no horizontal surfaces are employed.

(2) While these experiments are in progress horizontal aeroplanes on the Oionos Kite we have, should be converted into aero-curves so as to enable us to ascertain by actual experiment, whether aero-curves in such a structure are really more efficient than aeroplanes. This is the point we should ascertain immediately as the results will guide us in the form of supporting surfaces to be used in Drome No.6. Experiments with the Oionos Kite can be carried on simultaneously with the Cygnet II experiments.

(3) As soon as we have determined the point as to whether curved or flat supporting surfaces are best in the Oionos form of structure we should begin the construction of the aerial part of Drome No.6. This need not interrupt experiments with Cygnet II, or the Silver-Dart.

(4) The Silver-Dart should be experimented with as much as possible without interrupting the above work. The engine will be needed for experiments with Cygnet II but there will be plenty of opportunity during repairs upon that structure and after we have raised it into the air for experiments to be made with the Silver-Dart. A great many trial flights should be made on the ice specially with the object of practicing to make a good landing. Short flights 5 4 and many of them and also practice in turning so as to gain control over the apparatus. Long flights should be made in a circle of large diameter on Baddeck Bay, and not at first in a straight line.

In these sustained flights it is important that Mr. McCurdy should not go far away from assistance. The Laboratory Staff (and incidentally the doctor) should take their station on the ice at about the center of the circle so that they will not have far to go should any accident happen.

Mr. McCurdy should not attempt a long sustained flight in a straight line until we are satisfied, by experiment, that the engine will hold out for such a long flight and that McCurdy has had sufficient practice to render it advisable for him to go miles away from assistance. A.G.B.

6

Sympathetic Vibration.

March 10, 1909 :— I noticed yesterday that some of the struts in the Silver-Dart were thrown into vigorous vibration by periodic impulses transmitted from the engine. The amplitude was so great as to suggest the advisability of taking precautions against the rupturing effects of sympathetic vibration.

My first thought was to guy the strut at the middle point, but this would only partly meet the difficulty. It might check the fundamental vibration of the strut but would not prevent a sympathetic vibration responding to the a o ctave, for the dampening effect would come upon a natural nodal point, and the two segments of the strut on either side, being in this case of equal length, would be capable of vibrating like the two prongs of a tuning fork and would reinforce each others action.

If we load one prong of a tuning fork so as to throw it slightly out of tune with the other prong the fork is “dead”. In applying this principle to the strut attach the guy wire to one side of the middle point so that the two segments are unequal and in this manner we may render the strut insensitive to sympathetic vibration. It will be “dead” so to speak in the acoustical sense. In attaching the guy wire it might be well to avoid any of the natural nodal points of a vibrating chord.

If the normal frequencies of the two segments of a strut are not the same, and are not multiples of one another, the tendency of one segment to vibrate sympathetically with 7 2 some outside periodic disturbance will be checked and neutralized by the tendency of the other segment to vibrate at a different rate.

Ex-centric guy wiring may thus afford a remedy to the dangers due to sympathetic vibration. Guy wires themselves have a strong tendency to be thrown into vibration and the extra strain produced by their sympathetic vibration might be quite sufficient, especially with thin wires, to cause them to snap. If their vibration is dampened at a point near their central parts and not a natural nodal point so that the frequencies of the two segments are not the same and are not harmonics of one another, or harmonics of a common fundamental, the vibration of the unequal segments, under the influence of sympathetic vibration, will check and neutralize one another. The more I reflect upon the principle involved the more I realize its importance in a flying-machine. In such a structure there must necessarily be many parts so thin in proportion to their length as to be subject to periodic vibration. All such parts will be eminently susceptible to sympathetic vibration from disturbances propagated from the engine and thus unsuspected strains may be introduced capable of producing rupture in important parts of the structure and especially in those parts, like guy wires, which are under tensional strain. In my opinion all such parts should have attachments to act as dampers near, but not at, their central points so as to cause them to be divided into two unequal seg ?? men ts having different normal rates of vibration so arranged as to 8 3 neutralize each others action when under the influence of periodic disturbances from outside sources. In a word the remedy is ex-centric dampening. A.G.B.

9

The Flights of the Silver-Dart .

March 11, 1909: — On March 8 and again on March 10 McCurdy made flights in the Silver-Dart of more than 8 miles each. This demonstrates that the Aerial Experiment Association has pushed its investigations relating to the Hammondsport type of machine beyond the experimental stage. I do not however feel full confidence in the engine and

I think that under the best circumstances we are not obtaining her full power. On March 9 we could not raise the Silver-Dart into the air when going in the same direction with the wind; and even when going against the wind she flew in a very “logey” manner. It is obvious that we have no surplus power and a very little wind robs the Silver-Dart of its support. The engine is nominally 50 H.P., but I don't think under the best circumstances we get half that amount. Brake tests have been ordered before any other experiments are made to let us see exactly what power we are getting. I have so little confidence in the engine that I feel our only chance of winning the Scientific American Trophy lies in the weather, unless at least Mr. Curtiss should be able to be present. He has only to look at the engine to get it to run well! Without his presence the result will be very problematical. A.G.B.

Brake Tests .

March 11, 1909 :— Brake tests of the Curtiss No.3 engine were made this afternoon with the astonishing result that we seem to be getting only from six to eight horse-power. Surely the 10 engine must have been more efficient when the flights were made. It seems hardly possible that the Silver-Dart could have sustained herself in the air without an output of three or four times that amount. The tests will be repeated to-morrow for verification. A.G.B.

11

March 12, 1909 :— Great consternation prevailed here yesterday (March 11) over the results of our brake tests which indicated that we were only getting 8 horse-power from our 50 horse-power engine. Our hopes of capturing the Trophy for the second time seemed to be suddenly dashed to the ground.

To add to our mortification we expect del a e gates from the Aero Club to arrive here very soon to witness the flight and we have no other engine available for the Silver-Dart. Mr.

Curtiss too notified us he will probably be unable to be present to help us with his expert advi s c e.

Under these circumstances we all of us felt very blue last night; and we kept the telegraph wires hot with appeals to Curtiss for suggestions, and with telegrams to the principal makers of Automobile engines in Canada and the United States to find out whether reliable commercial motors could be obtained at once that would be suitable for our use.

At present we are entirely dependent upon an engine which has several times given trouble, even in the hands of Mr. Curtiss himself, while, in our hands, it occasionally balks and loses its power.

We look back upon last night, Thursday March 11, as upon a nightmare. “Black Thursday” we may all call it, the darkest day in the history of the Association. It is always darkest however just before dawn, and this morning (March 12) the cause of the trouble with the engine was discovered.

In the forenoon seven of the eight cylinders were working well yielding about 26 B.H.P.; and this afternoon 12 the eighth cylinder began to behave and the engine gave us 31 B.H.P. We now have much more confidence in the engine; but feel that it might be wise to secure a good reliable automobile engine to be used as a substitute in the event of another break down of power. A.G.B.

Changes in Cygnet II .

March 12, 1909: — The runners have been bent as shown in a photograph in this Bulletin and have been strengthened by a backing of wood. The aviator's seat has been raised and strengthened.

The vertical rudder has been placed below instead of above the front control, permitting the front control to be operated as in the Silver-Dart, and affording a buffer in front in case of a bad landing.

The steering wheel is pulled by the aviator when he wishes to rise and pushed when he desires to come down, favoring leaning backwards when steering up and leaning forwards when steering down. Thus the change in the position of the center of gravity produced by the movement of the aviator's body co-operates with the action of the front control. The opposite was formerly the case. A.G.B.

13

EXPERIMENTS: Reported by the Editor .

Endurance Test of Curtiss No.3 Engine .

Feb. 27, 1909: — The experiments with the Silver-Dart (Feb. 23–24) seem to indicate that McCurdy could fly in the Silver-Dart as long as the engine held out. Before deciding to try for the Scientific American Trophy which demands a flight of 16 miles involving about 20 minutes in the air, it was thought well to test the endurance of the Curtiss No.3 engine. We decided that if we had reason to believe that the engine would run satisfactorily for half an hour, we would apply for the Trophy, but if the engine broke down or became overheated in a short period of time we would make no application at the present time. The endurance tests were commenced to-day (Feb. 27), but the results were not satisfactory. I give below accounts of experiment by McCurdy and Bedwin. A.G.B.

McCurdy's Account :— This afternoon (Feb. 27) preparations were made to conduct the endurance test of Curtiss No.3 while mounted on the iceboat.

The ice brakes were first “put on”, so as to prevent the engine from advancing, and the engine started up as a preliminary test before we ventured out on the ice. After a few minutes of running it was noticed that the counter shaft bearing was getting warm and upon stopping the engine it was discovered that the hardened sleeve over the shaft which comes in direct contact with the roller bearings had slipped out of place owing to the shearing of the pin which was to 14 2 hold it in place. A few rollers will have to be replaced and with several other details will take a few hours to make ready for another trial. J.A.D. McC.

Bedwin's Account :— Put Curtiss No.3 on ice-boat to-day (Feb.27) and on running the engine for about three minutes found that the sleeve on counter-shaft had sheared the pin that held it to shaft proper and as this allowed sleeve to slide backwards breaking some of the rollers in bearing, had to postpone endurance tests. This counter shaft and gear was only designed for use with the light power motor but think it will be all right with a few slight changes. W.F.B.

March 1, 1909 :— Experiments to test the endurance of the Curtiss No.3 engine were continued to-day (March 1). In order to put the engine in as nearly as possible the same condition it would be in the air, it was decided to place it in the ice-boat and propel it over the ice so as to allow the wind of advance to act on the radiator. A vertical radiator was employed as shown in a photograph in this Bulletin. The result was not satisfactory as the engine became heated in about four minutes time. I give below McCurdy's account of this experiment.

McCurdy's Account :— Curtiss No.3 engine was put through an endurance test this afternoon (March 1).

We wished to ascertain whether the vertical radiator which has been used so far in the Silver-Dart, was sufficient to keep the water for cooling the motor, below the boiling point. The propeller used to-day was the new perfect 15 3 screw 22° at tip and 8 ft. in diameter. This produced a push of 150–200 lbs., geared 18–24 with the engine turning over 800–850 rpm. It can be easily seen that this is about the proper load to apply to the engine at that gearing. We ran the ice-boat down the harbor, round the point and up the Baddeck shore to the McLean property. This took four minutes of time and then we were compelled to shut off the power as steam was seen issuing from the radiator.

It was seen that the water was boiling and hence the proper amount of cooling did not take place although the relative wind velocity was about 40 miles per hour.

As we shut off the power the brake was applied and its efficiency was demonstrated by the boat stopping quite suddenly causing me to gently roll off in front.

We waited there a few minutes till the water seemed cool enough to run us home and then headed the boat for the end of Long Sand Point. We were forced however to stop again owing to the heating of the water in the radiator. A third start and we arrived safely at the boat house.

We planned to replace this vertical radiator by the automobile A.Z. radiator we have on hand and a test will be made to-morrow.

If this also proves inefficient the cooling can be effected by the assistance of a centrifugal blower driven from the engine. J.A.D. McC.

March 2, 1909: — An experiment was made to-day to test the endurance of the Curtiss No.3 engine with an automobile radiator having a square face shown in a photograph in this Bulletin.

16

4 The result was satisfactory as the radiator remained cool after a run of 20 minutes, and there is no reason to believe that it would be heated by a longer run. We have therefore decided to apply for the Scientific American Trophy. I give below McCurdy's account of this experiment. A.G.B.

McCurdy's Account :— This morning the engine Curtiss No.3 was given the endurance test proposed in connection with the ice-boat. We replaced the vertical type of radiator by the specially designed automobile radiator built by the A.Z. Company.

The test was entirely satisfactory the radiator being just as cool after a 20 minute run as it was when we started. The propeller employed was the same one used in yesterday's experiment, 8 ft. in diameter, perfect screw throughout and 22° at the tip. This gives a pitch speed of 10 feet per revolution of propeller.

The ice was covered over with about 3–4 inches of hard snow and even with this extra load we went from the shed around the Long Sand Point and up to Baddeck Wharf in 8 ½ minutes. We did not obtain accurate data concerning the push of the propeller, as the ice-boat advanced, but the general conclusion was that the push dropped.

This is a satisfactory test and with everything else working as well we feel sure that our contemplated hour or more flight with the Silver-Dart can be easily accomplished. J.A.D. McC.

17

5 Testing the Strength of Cygnet II .

March 2, 1909 :— In the second trial of Cygnet II (Feb. 24) one of the guy wires attached to the engine bed had snapped and it was therefore thought well to test the tensional strength of the parts supporting the engine and man by supporting the machine so as to allow the engine etc. to hang without touching the floor (Bulletin XXXIV p. 32). In all our previous tests the engine part had been supported from below, whereas in actual flight it would be supported from above. The experiment of supporting the body part containing the engine and man from above instead of below was tried to-day (March 2), and the structure seemed to be sufficiently strong for the purpose. I give below McCurdy's account of this experiment. AGB.

McCurdy's Account :— To-day (March 2) the center panel of Cygnet was tested by suspending machine by its wings alone and then placing three men, along the keel stick, to represent the weight of the po ?? we r plant and aviator. No deflection was noticed. J.A.D. McC.

The Russian Propeller

March 3, 1909 :— Experiments were made to-day with the propeller constructed to test the essential features of the Russian propeller of Col. Ochtcheuny (see Bulletin XXXIV p.1); also see photograph in this Bulletin. The maximum push obtained was 25 lbs. with 650 rpm. The push fell off with less rotation and with greater. I give below accounts of this experiment by McCurdy and Bewdin. A.G.B.

18

6 McCurdy's Account :— Russian propeller given test on ice-boat this morning (March 3). Ice-boat not allowed to advance. Gear 18–24.

Pull Rot. of engine lbs. 25 650 Max-push 0 750

This seems to mean that the push of the propeller decreases on both sides of 650 revolutions.

The push indicator stands at zero before the engine is started. As the speed of the engine is increased the push indicator pointer advances showing a slow increase in push till the speed of the engine is 650 rpm. The push now is 25 lbs. As the speed of the engine is increased the push falls off till finally at 750 rpm. the push is again zero. Two separate experiments were made.

I would suggest that perhaps the reason for the falling off in push as the rotations were increased might be that the curves of the blades flattened out as the speed increased.

We stationed Malcom McFarlan at one side to observe whether or not this flattening took place as the speed of rotation was increased and he reported that there was a decided flattening of the curves in the blades. J.A.D. McC.

Bedwin's Account :— To-day (March 3) on running engine with retarded spark turning up 650 rpm pull was 25 lbs. Immediately on advancing spark pull dropped to nothing. Think it due to twisting of the arm supporting blades reducing the pitch of blade to zero angle under the increased speed of rotation.

W.F.B.

19

EXPERIMENT OF PILOT KITES OF SILK AND JAPANESE PAPER .

March 6, 1909:— We tried comparatively to-day two kites of the Frost-King form, one of red silk and the other of Japanese water-proof paper. The object was to ascertain whether slight porosity in the surfaces employed affects the efficiency of a kite in a sensible degree. The red silk used is similar to that employed in Drome No.5, Bell's Cygnet II. It is slightly porous as we readily discover by blowing through it. The Japanese water-proof paper is absolutely impervious to air. Each kite is 300 cm wide on top, and 150 wide at bottom, 150 cm deep from fore to aft, and 150 cm high (oblique), and contains 182 cells, having a total surface of 9.8507 sq. m oblique. Silk kite weighs 4081 gms. Paper kite weighs 4654 gms. Line 100 m long weighs 1100 gms. Line attached + 50 cm from center of kite.

Exp. 1. Silk

Wind 13.80 mph Pull Alt 16 40 12 41 10 43 12 42 16 40 16 39 12 38 14 38 10 36 12 39 130 396

Exp. 2 Paper.

Wind 12.50 mph Pull Alt 8 34 10 33 6 30 9 28 18 34 6 35 6 30 11 30 16 32 10 28 100 314

20

2 Exp. 3. Silk

Wind 13.50 mph Pull Alt 16 35 16 42 12 44 18 39 18 38 16 36 20 38 10 41 8 40 12 42 146 395

Exp. 4. Paper .

Wind 10.80 mph Pull Alt 12 30 12 30 10 32 10 26 12 27 8 28 4 18 9 16 6 16 6 20 89 243

Exp. 5. Silk

Wind 15.30 mph Pull Alt 16 40 12 41 12 42 13 38 10 35 16 34 15 40 16 38 18 40 16 42 144 390

Exp. 6. Paper.

Wind 10.40 mph Pull Alt 8 31 10 30 7 30 6 29 5 28 8 26 10 29 11 30 8 35 7 35 80 303

Exp. 7. Silk

Wind 12.80 mph Pull Alt 10 33 12 35 8 36 16 35 10 36 10 36 7 35 10 38 7 38 8 37 98 359

Exp. 8. Paper .

Wind 16.90 mph Pull Alt 26 40 25 41 32 45 35 44 34 46 26 46 28 45 33 47 28 46 30 42 297 442 21

Exp. 9. Silk .

Wind 15.20 mph Pull Alt 16 38 16 38 10 39 12 37 14 39 12 38 13 36 16 35 14 34 17 32 140 366

Exp. 10. Paper .

Wind 15.70 mph. Pull Alt 12 37 18 36 24 38 20 40 16 38 14 38 10 45 9 43 16 37 15 36 154 388

Exp. 11. Silk

Wind 15.80 mph Pull Alt 16 45 16 44 20 45 20 44 18 38 20 38 15 40 14 44 10 46 8 48 157 432

Exp. 12. Paper

Wind 14.10 mph Pull Alt 16 50 25 50 20 49 20 46 17 45 20 53 14 52 18 50 20 50 16 55 186 500

Exp. 13. Silk .

Wind 12.80 mph Pull Alt 18 43 16 45 18 42 20 42 20 40 25 41 20 41 16 40 12 40 18 41 183 415

Exp. 14. Paper

Wind 16.80 mph Pull Alt 26 45 18 40 27 35 24 41 20 46 24 39 18 36 22 38 20 40 32 39 231 399 22

4 Exp. 15. Silk

Wind 19.60 mph Pull Alt 24 40 26 40 24 40 20 40 18 39 22 38 32 36 30 43 25 42 26 43 247 401

Exp. 16. Paper .

Wind 18.40 mph. Pull Alt 34 40 23 41 31 45 25 45 34 43 28 45 25 46 34 42 24 45 30 43 288 435

Exp. 17. Silk

Wind 18.60 mph Pull Alt 32 39 30 35 34 42 28 40 32 40 34 39 25 37 28 40 30 40 28 40 301 392

Exp. 18. Paper .

Wind 17.50 mph Pull Alt 32 43 30 43 34 43 35 42 40 43 33 41 38 40 32 42 38 44 34 42 346 423

Exp. 19. Silk

Wind 18.70 mph Pull Alt 28 42 25 38 24 40 26 38 25 40 22 38 22 39 24 41 20 40 25 41 241 397

Exp. 20 Paper .

Wind 17.20 mph Pull Alt 30 44 32 44 36 40 28 42 28 41 30 41 33 41 36 43 28 44 25 44 306 422 23

SUMMARY TABLES .

Silk Kite .

Exp. Pull Alt Wind Obs lbs Obs Angle Obs mph Exp. 1 10 130 10 396 1 13.80 Exp. 3 10 146 10 395 1 13.50 Exp. 5 10 144 10 390 1 15.30 Exp. 7 10 98 10 359 1 12.80 Exp. 9 10 140 10 366 1 15.20 Exp.11 10 157 10 432 1 15.80 Exp.13 10 183 10 415 1 12.80 Exp.15 10 247 10 401 1 19.60 Exp.17 10 301 10 392 1 18.60 Exp.19 10 241 10 397 1 18.70 Total 100 1787 100 3243 10 156.10 Average 17.87 lbs. 39°.43 15.61 mph

Paper Kite .

Exp. Pull Alt Wind Obs lbs Obs Angle Obs mph Exp. 2 10 100 10 314 1 12.50 Exp. 4 10 89 10 243 1 10.80 Exp. 6 10 80 10 303 1 10.40 Exp. 8 10 297 10 442 1 16.90 Exp.10 10 154 10 388 1 15.70 Exp.12 10 186 10 500 1 14.10 Exp.14 10 231 10 399 1 16.80 Exp.16 10 288 10 435 1 18.40 Exp.18 10 346 10 423 1 17.50 Exp.20 10 306 10 422 1 17.20 Total 100 2077 100 3869 10 150.30 Average 20.77 lbs 38°.69 15.03 mph 24

EFFICIENCIES.

Silk Kite :— Average altitude 39° .43 say 39° 30‘. Average pull 17.87 lbs. Weight of kite and line 11.41 lbs.

Angle 39° 30‘

Sin. .63608 say .636

Cos. .77162 say .772

Pull 17.87 lbs.

Vertical 11.38 lbs.

Horizontal 13.82 lbs.

The total weight lifted, consisting of kite and line, 11.41 lbs., and the vertical pull of the flying line, 11.38 lbs., amounted to 22.79 lbs. This is the lift element.

The horizontal pull of the flying line, 13.82 lbs., constitutes the drift element.

Efficiency = Lift/Drift = 22.79/13.82 = 1.64

Japanese Paper Kite :— Average altitude 38° .69 say 38° 45'. Average pull 20.77 lbs. Weight of kite and line 12.67 lbs.

Angle 38° 45'

Sin .62592 say .626

Cos. .77988 say .780

Pull 20.77 lbs.

Vertical 13.00 lbs.

Horizontal 16.20 lbs.

The total weight lifted, consisting of kite and line, 12.67 lbs., and the vertical pull of the flying line, 13.00 lbs., amounted to 25.67 lbs. This is the lift element.

25

The horizontal pull of the flying line, 16.20 lbs., constitutes the drift element.

Efficiency = Lift/Drift = 25.67/16.20 = 1.58

Comparison.

Efficiency of silk 1.64

Efficiency of Jap. Paper Kite 1.58

It thus appears that there is not much difference between the efficiency of a kite having silk surfaces like those employed in Cygnet II, and a kite having perfectly air-tight surfaces of Japanese water-proof paper. In both cases the efficiency is substantially 1.6. That is the lift is 1.6 times the c d rift.

The Silk Kite seems, if anything, to be slightly more efficient than the Japanese paper kite (1.64 against 1.58). Comparing the two we may note that the silk kite weighed less than the other and flew at a greater altitude in a greater wind with less pull. A.G.B.

26

HYDRODROME TOY .

March 6, 1909 :— The Hydrodrome Toy referred to in Bulletin XXXIV p.22, which had been sent back to the Laboratory (Feb.16) to have larger hydro-surfaces attached, was completed a number of days ago but, in the interest aroused by the trials of the Silver-Dart and Cygnet II, Mr. Bedwin forgot to report it. It was produced at Conference to-day and was immediately taken up to the McNeil Spring and towed by a fishing line attached to a bamboo pole. It rose very prettily out of the water when towed at a very slight speed. It interested all of us very much and we have no doubt that it may be made the basis of an attractive toy.

It means more than a toy to me for I fancy we can work out the form and arrangement of hydro-surfaces, as well on a small model of this kind as on machines of the size of the "Dhonnas Beag" and "Query". A.G.B.

TESTING BATTERIES .

March 6, 1909 :— It was decided at Conference to-day that it would be well to have an endurance test for the Voltaic Batteries employed on the Curtiss No.3 engine. We have found that the automobile radiator cools the engine perfectly so that there can be no doubt that we can rely upon her working for half an hour, which is more than enough time for the

Silver-Dart to run the 16 miles required to win the Scientific American Trophy, and it was thought wise to test the endurance of the batteries to be sure that they too would last for more than one-half hour's continuous use.

27

2 The battery cells, with buzzer attached, were taken to the Point to-day. The amperage was ascertained before starting the buzzer and after half an hour was found not to have fallen materially.

To be perfectly sure of the result another experiment was made the buzzer being left on for 4 ½ hours. At the conclusion of this experiment it was found that the buzzer was still working vigorously and that the amperage had only fallen from 19 to 12.

There is no reason, therefore to fear that the battery would fail us on a half hour test of the Silver-Dart.

A.G.B.

28

EIGHT MILES IN THE SILVER-DART .

March 8, 1909:— Experiments with Silver-Dart resumed this morning. McCurdy made four short flights to practice landing on the ice, and then flew 8 miles without stopping, going to Stony Island and back passing through Baddeck Harbor. The following accounts of to-day's experiments are by McCurdy and Baldwin. A.G.B.

McCurdy's Account :— We planned for this morning's (March 8) program a series of short flights so that practice could be obtained in making the landings.

We first attached the eight foot diameter, 22° at tip perfect screw propeller and took the machine out on the ice. The wind was south-west by west having a varying velocity from 3 to 7 miles an hour. The Dart was taken off the Laboratory and headed for Black

Island and upon the signal being given to let go she moved forward very slowly and failed to respond to the lifting effect of her front control. It was quite evident after a moments running that she wouldn't rise and so to give the engine a good run I took a wide circle in the direction of the Baddeck shore and brought the machine back to the starting point. On the supposition that this propeller was too heavy a load we removed it and attached instead the same propeller used in flights of Feb.23 & 24. The tachometer showed after a little tuning of the engine about 1000 rpm. We one more headed the machine in the direction of Black Island and this time made a little jump of about 200 ft. at an elevation of 6 ft. and effected a landing 29 2 without any jar to the machine. She was now headed round directly with the wind and this time a flight of about ½ mile was made and a good landing negotiated. We reasoned that perhaps a little more oil in the crank-case would be a benefit to the engine and so injected six squirt-gun fulls. In the mile flight which followed I hugged the Baddeck shore until off the Log Cabin, then took a wide circle to the left. On approaching the Beinn Bhreagh shore the engine gradually slowed up dropping me gently to the ice. After landing was made in front of the Lodge Wharf we discovered that the gasoline cock had become partially closed from vibration. This was tightened up and the machine wheeled down the Bay till about off Fraser's Pond. Here as before she was turned round and a flight started up the Bay. I flew close along the Baddeck shore passing Baddeck inside of Kidston's Island; took a long turn to port around Stony Island coming back over the same route and landing in front of the Dart's shed covering a distance of about 8 + miles in 11 minutes and 15 seconds as recorded by Mr. Cox. J.A.D. McC.

Baldwin's Account :— Got away to a comparatively early start about 8 o'clock this morning (March 8). Weather and ice perfect. Engine when cold ran badly but warmed up and did better. However it would not drive the 8 ft. propeller with 3:4 gearing more than about 800 rpm. Shifted to old propeller 7‘ 6“ diameter same gearing. This worked much better engine speeded up to about 900. After some tuning got engine speed up to 1000 rpm. With the 8 ft. propeller Dart would 30 3 not fly but with smaller one was able to sustain herself.

John made a number of short flights practicing landing. Then made long flight of about ¾ of mile. Then decided to try longer flight with turn. John started by Mr. Carruth's and flew beautifully along Baddeck shore went on through Baddeck Harbor and rounded Stony Island. Came back very steadily landed easily. Time 11 minutes, 15 seconds. Distance about 8 miles. Engine cooled perfectly but judging from propeller speed did not seem to be developing more than 20 H.P. F.W.B.

31

SILVER-DART EXPERIMENTS CONTINUED .

March 9, 1909: — The Silver-Dart was taken out on the ice this afternoon there having been too much wind in the forenoon for experiments. The afternoon wind was from the NW about 10 miles per hour and dying down but puffy. It was decided to be inadvisable to attempt a long flight on this account and because the engine was skipping and evidently not giving its full power.

Going against the wind a flight of about one-half mile was made at an elevation of about three feet. (McCurdy aviator). Traveling with the wind the machine did not rise. The machine appeared to be “logey” and the engine was not working satisfactorily.

While the machine was held stationary upon the ice during an engine test I noticed that two of the struts in the front of the machine on either side of where McCurdy was sitting were thrown into sympathetic vibration by the shaking of the engine. It might be a matter of precaution to dampen their vibrations by guy wires in the middle or tune them by loading so as not to respond to transmitted vibrations, from the engine. A.G.B.

32

TWO LONG FLIGHTS

March 10, 1909: — Mr. McCurdy and Mr. Baldwin report two long flights of the Silver-Dart this morning. Each exceeding eight miles, probably at least nine miles.

Yesterday (March 9) two spruce bushes were imbedded in the ice at a measured distance of four miles from one another. One of these is in the middle of Baddeck Bay. The o other is in St. Patrick's Channel about a mile beyond Stony Island. Starting in Baddeck Bay McCurdy flew to-day in the Silver-Dart past Baddeck into St. Patrick's Channel and started a turn after passing the spruce bush there. Making a wide turn he returned through Baddeck Harbor back to his starting point in Baddeck Bay. He had intended to make this course twice without stopping as it would constitute a flight equivalent to that required to win the Scientific American Trophy (25 kilometers, about 16 miles). The engine, however, did not seem to be working satisfactorily and he touched the ice two or three times in returning.

After tuning up the engine another flight around the course was made without touching. The following are the reports submitted by McCurdy and Baldwin:—

McCurdy's Account :— Experiments resumed with Silver-Dart this morning. Beautiful day; wind recorded by anemometer 2 ½ miles per hour, about SW by W.

Course chosen was along the Baddeck shore through Baddeck Harbor past Stony Island and around a bush placed on the ice about a mile above Stony Island, the direct distance from this bush to the starting bush off Matheson's forge being four miles.

33

2 In coming back the power gave out and the machine touched the ice just off Bert Hart's. I realized that the engine was heating so slowed her down under retarded spark till I reached the Western end of Kidston's Island. Here I advanced the spark and the machine rose and flew through Baddeck harbor and down to Sam Campbell's. Here she fell again, and from there home it was a series of jumps. Time 20 minutes. It was discovered that the stop-cock in the water-pipe had jarred round so that most of the water had escaped. This defect was remedied and the radiator filled again. The time the same course was covered

in full flight. Time 13 minutes. The full distance including the turn and start was about 9–9 ½ miles. “Remember Chicago” put an end to the experiments. J.A.D. McC.

Baldwin's Account :— During first long flight McCurdy was away 20 minutes. Came back along the ice. Time for last ½ mile over ice 30 seconds. Second long flight lasted 13 minutes. Wind before flight on three readings 5-7-6 miles per hour. Time for last ½ mile 47 seconds (45 Bedwin's watch. Wind at time 2.5 miles per hour quartering. This gives speed of 38.3 miles per hour, neglecting wind which seems to be slow, however method of getting time may have given rise to a certain amount of error. Even allowing for last time in first flight while machine was on ice there seems to be a wide variation in speed. Engine uncertain throughout. F.W.B.

34

Brake Tests .

March 11, 1909 :— Mr. McCurdy reports brake test this afternoon as follows:—

McCurdy's Account :— This afternoon engine Curtiss No.3 was subjected to a brake horse-power test.

It was mounted on the ice-boat and a gasoline barrel was provided filled with water for circulation through the jackets to prevent over heating. In this way the water was kept at practically a constant temperature all through the test.

The recently obtained water-cooled brake pulley was bolted to the flange and a brake arm 5‘ 3“ long attached in the usual manner, the load being applied by tightening up the screws of the fibre lined band which surrounds the pulley. The motor was not in as good shape as she must necessarily be to fly the Silver-Dart. This was shown by a constant irregularity in the expansions. However several readings were taken which indicate not what the motor may be capable of developing, but what she developed at that experiment. The best result obtained was 8 horse-power at 800 rpm. J.A.D. McC.

The following is Mr. Baldwin's report of the same test.

Mr. Baldwin's Account :— After making several unsuccessful attempts to fly Silver-Dart we took advantage of the opportunity offered by shifting motor into No.5 to put the brake on her. The engine was running very badly. leaky valves and cylinders probably being partly responsible. There was almost 35 2 continual back-firing through the intake pipe and a satisfactory mixture for all cylinders could not be obtained. Ho ?? we ver several readings were obtained during all of which the cylinders were firing.

Brake arm was 5‘ 3“ in length. Engine speeds were taken tachometer. Weight of brake arm on spring balance side was balanced by lead weight so no allowance was made for it.

P. R.P.M. B.H.P. 10 800 8.00 6 1100 6.60 5 1200 6.00 5 1200 6.00 5 1200 6.00 7 1050 7.35 7 900 6.30

These readings of course do not give any idea of what power the motor is capable of producing, but indicate that the power we are getting from it is absurdly low.

F.W.B.

March 12, 1909: — The brake tests made to-day with the Curtiss No.3 engine are more satisfactory and encouraging. The cause of the trouble with the engine has evidently been discovered at the Laboratory and remedied.

The maximum brake test this morning exceeded 26 B.H.P with only 7 cylinders running. It is believed that with all the cylinders runn n i ng we can rely on 30 B.H.P. I give below Baldwin's account of this morning's experiments, which were made by Mr. McCurdy.

Baldwin's Account :— This morning brake test was continued to find out what was the trouble with the motor. The trouble was soon discovered and remedied. The timing was found to be so 36 far off that the engine would not run. It was evident that the cam on the distributor has been slipping for some time past so that the spark came much too early.

When the timing was corrected the engine gave much better results ans the following results were obtained.

P. R.P.M. B.H.P. 14 1400 19.60 16 1200 19.20 22 1100 26.20 22 1100 26.20 26 1000 26.00 26 900 23.40 27 900 24.30 27 900 24.30 26 1000 26.00 28 800 22.40 16 1400 22.40 23 1100 25.30 20 1250 25.00 20 1000 20.00 16 1300 20.80 15 1200 18.00 16 1200 19.20 12 1400 16.80

Only seven cylinders were firing during this test as it was taken just before lunch and there was no time to take out bad sparking plug on the cylinder which was dead.

30 H.P. should be available all right when the eight cylinders are all firing. F.W.B.

In the experiments made this morning (March 12) only seven cylinders were working. This afternoon the eighth cylinder was put in good order and numerous brake tests were made with the following results which have been reported by Mr. McCurdy:—

37 2 P. R.P.M. B.H.P. 32 950 30.40 34 900 30.60 28 1100 30.80 18 1300 23.40 16 1400 22.40 26 1200 31.20 27 1100 29.70 28 1100 30.80 32 950 30.40 34 850 28.90 28 1000 28.00 24 1200 28.80 20 1350 27.00 18 1400 25.20 18 1400 25.20 16 1500 24.00 24 1200 28.80 26 1050 27.30 24 1150 27.60 26 1100 28.60 24 1200 28.80 26 1050 27.30 28 950 26.60 26 1050 27.30 16 1450 23.20 12 1500 18.00 10 1550 15.50 20 1100 22.00 20 1100 22.00

We were all in great tribulation over the poor results obtained yesterday (March 11) which yielded a maximum of 8 H.P. for our engine. To-day's experiments however have reassured us and indicate that we may rely upon getting at least 30 B.H.P. whenthe engine is in good running order. A.G.B.

New Propeller for Cygnet II .

March 12, 1909:— The new nine-foot propeller for the Cygnet II has been completely. Mr. Bedwin reports as follows:—

“ Put 9 ft. perfect screw propeller on gear 2 to 1 on ice-boat to-day (Mar.12) with Curtiss No.3 engine. The gear seemed just right, engine turning up 1100 rpm. Propeller is 9 ft. in diameter, 19° 30‘ at tip (10 ft pitch) perfect screw.” Wm. F.B.

38

No attemp y t was made to ascertain the push of the propeller as McCurdy's Indicator requires re-adjustment, and re-testing before it can be used. This re-adjustment of the scale would take at least half a day to accomplish, so, as time is precious, it has been deci ? d ed to put the engine and propeller on Cygnet II immediately without waiting to ascertain the push. A.G.B.

39

1909 FEB 27

138269-A

1909 MAR 2

1909 MAR 5

1909 MAR 5

1909 FEB 1?

41 138277-A 42 138665-A 138276-A 43

1909 MAR 11

1909 MAR 11

44

Charles J. Bell to Bell.

Washington, D.C., March 8, 1909: — Your telegram of the 6th reached me on the 7th, being delayed I presume on account of the tremendous storm which greeted the incoming of Mr. Taft as President on March 4th, and which did a great deal of damage to our telegraph and telephone lines.

The Bulletin NO. 34 of March Ist reached me on the fourth, but on account of it being inauguration week I did not have time to read it until yesterday, Sunday.

I am very clearly of the opinion that plan No.1 is the only feasible one to follow at the present time. The Association having no patents, not even an application for one on file in the Patent Office, would make it impossible to interest outside parties at this time, and even if men could be interested financially it would entail a moral obligation on you and your associates to see that the inventions, which you claim to have made, were in fact patentable and do not infringe on the inventions of others, which position of course you would not care to assume.

Taking it for granted that plan No.1 would be adopted, I can only make one or two suggestions as to the detail of organization.

One: I do not know whether the laws of New York are as favorable as those of West Virginia for such an organization. This should be looked into by a corporation lawyer before final decision as to the State is made.

45

2 Two: I would suggest that the par value of the stock be Ten Dollars.

Three: The entire capital stock should be issued in payment for the transfer of the property of the Aerial Experimental Association, and then $65,000. of the amount put back by them into the Treasury of the Company.

The advantage of this plan is that the stock in that manner is made fully paid and not assessable, and can be sold from time to time at such prices as a Board of Directors may deem proper in the interest of the Company.

While at present you might think it advisable to sell the Treasury stock only at par or over, it might become advisable to sell a portion below par, and then the question always arises as to whether such stock is assessable for debts of the Company.

As to whether $10,000. is sufficient working capital for a year's work, I cannot judge. I have no doubt, from my conversations with Mr. Cameron, that the charges of his firm for taking out the patents will run from $1000. to $1500, on account of the visits necessary to be made to Hammondsport and extra work in preparing the specifications and drawings.

I do not know whether administration has been taken out on the estate of Mr. Selfridge. I wrote, at your suggestion, to this father, who stated that he would qualify as administrator, but I have not heard from him since as to whether he did so. His signature will be necessary in the patent application, and to prevent delay I hope you will 46 3 urge him to act promptly in the matter.

The last Bulletin is an extremely interesting one, especially the photographs in the latter portion.

(Signed) Charles J. Bell.

47

Mauro, Cameron, Lewis & Massie to Bell .

Washington, D.C., March 5, 1909 :— Flying Machine Specifications. We herewith enclose two specifications in this matter, one of them to be executed by Mr. F.W. Baldwin, and the other by the joint inventors.

In the Baldwin application we have included the subject matter of former claims, 40, 41 and 42 as claims 18, 19 and 20. We note Mr. Baldwin's suggestion that claim 20 (former 42) should be omitted, because some detail of the method employed in rendering the truss members adjustable was not original with any of the members. It is not at all essential that it should have been so. You are quite right in your idea that the claim is for a combination of elements and the fact that it includes some feature that may have been suggested by others, or may have been derived from some outside source, is wholly immaterial. Under the law, an inventor is entitled to receive suggestions and to gather ideas from any source, and to utilize them in the structure of his invention.

Moreover, if Mr. Baldwin is the inventor of claims 1 to 17 of the application sent herewith, then claims 18, 19 and 20 of said application belong to him, and no one else. Claims 18 and 19 cover the sectional feature of the frame, and under the law, Mr. Baldwin, being the inventor of the rigid frame defined in the other claims, is entitled to accept from other sources the suggestion that the frame could be a sectional one, and the fact that such suggestion is ma?? 48 2 and adopted by him does not, in the eye of the law, in the least militate against him as the inventor of such structure.

The joint application will have to be executed by Bell, McCurdy, Baldwin and Curtiss, and by the administrator of Selfridge's estate. We assume that Mr. Selfridge's father has been appointed administrator of his estate, and will execute the specification as such.

After the other members have executed the oath, we suggest that you forward the papers to Mr. Selfridge's father for execution, making such explanations as you see proper, and as would be within the scope of your understanding with him.

In executing the papers, we wish to call your attention to the fact that by a recent rule of the Patent Office, it will be necessary for the Notary Public before whom the papers are executed to impress his seal into each sheet of the specification . Please see that this is done by the Notary who takes the oath of you gentlemen in Nova Scotia, and then call Mr. Selfridge's attention to the fact that this must be done by the Notary who takes his oath.

Trusting that you will find the papers satisfactory, we remain, Signed) Mauro, Cameron, Lewis & Massie.

49

DIRECTIONS .

We are enclosing the original specification in each case and two carbon copies. The original is to be executed and returned to us; the carbon copies are to be retained for your files. We are also enclosing two sets of the blue prints in each case, which you may retain for your files.

In executing the specification, please have the signatures in the order indicated with two witnesses to each signature . Please be careful to fill up all the blanks indicating citizenship, residence and post-office address for each person, not only in the oaths, but in the petition. In view of the number of blanks necessarily left, great care will have to be taken to avoid omissions. Be careful that the Notary Public affixes his seal.

If you have to send the papers to Mr. Curtiss at Hammondsport to be executed, he can simply sign the oath and then have the Notary Public affix his jurat, being also careful to affix his seal, and have the seal impressed in each sheet of the specification .

Encs. 2 specs.,

2 carbons, and

2 sets b. prts.

(Signed) Mauro, Cameron, Lewis & Massie.

50

THE OUTLOOK ON AVIATION: By F.W. Baldwin.

The sensation of the week is the formation of the Herring-Curtiss Co. Presumably the object of this company is to manufacture heavier-than-air machines on the Herring patents. Mr. Curtiss disposes of his motor-cycle manufacturing plant to the new company and assumes the managership of it.

Mr. Cortland F. Bishop, President of the Aero Club, is the originator of the enterprise and associated with him are several wealthy members of the Aero and Automobile Clubs.

The papers have given themselves rather a free rein in outlining the immediate program for the new company according to some accounts. One hundred aerodromes a week is to be the output of the Hammondsport works until a larger factory can be built.

That level-headed American business men should back Mr. Herring has created quite a furore in aeronautical circles. It probably means that Mr. Herring has some more convincing arguments tha t n he has ever made public or — is it really the Curtiss Company with Mr. Her i r ing patents to flourish in the eyes of bewildered capitalists? So far as we actually know the Herring patents are only talking points at present.

All of which revives interest in Mr. Herring's machine built for the U.S. War Department. It is reported to weigh 175 lbs. complete without the aviator and be able to fly at 22 miles per hour minimum. It is also whispered that the maximum may exceed 80 miles an hour so that the public are still looking forward with great interest to the trials at Fort Meyer. Other enterpri ? s ing papers have a story that Dr. Bell is building a machine to cross the English Channel. For 51 more accurate information on this or any other aeronautical question we refer them to Mr. Milton Browne of the Sydney Psot.

We are in receipt of the first catalogue advertising aeroplanes for sale. The Franco-American Auto Co. of Montreal offer to supply fully tried out Voisin machines. Also Chanute Gliders for beginners.

In the last number of Automobilia there is an illustration of a good looking four-cylinder Renault motor. It is similar to the new motor Mr. Curtiss is getting out in its valve gear and cooling arrangement. Both intake and exhaust valves are in the head operated by a single rocker arm. The stroke of the engine, judging from the illustrations, is however much longer in proportion to the bore than the proposed Curtiss engine.

That the ordinary marine gasoline engine will soon be available for aeronautical work was clearly demonstrated by the New York Boat Show. The trend of all motors exhibited was towards reduced weight and more positive lubrication. The kind of work a marine motor is called upon for is very much the same as an aeronautical motor. A racing marine motor is designed to run continuously at its highest speed for hours at a time and it is encouraging to note that in marine practice several reliable makers now find it possible to make a motor at 10 lbs. per brake horse-power. This year's show was remarkable for the increase in two-cycle motors over the four cycle type. Last year there were about the same number each exhibited. This year there were nearly three times as many two-cycle as four cycle. F.W.B.

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXXVII Issued MONDAY, March 22 1909

ASSOCIATION'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell Assistant Editor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO.XXXVII ISSUED MONDAY MARCH 22, 1909 .

Beinn Bhreagh, Near Baddeck, Nova Scotia .

TABLE OF CONTENTS.

Mar. 9, Mrs. Fairchild to Bell 38–38

Mar. 9, Stairs to Bell 38–38

Mar.10, Curtiss to Bell 38–38

Mar.10, Associated Press to Bell 383–8

Mar.10, Bell to Associated Press 38–39

Mar.10, Cook to Bell 39–39

Mar.11, Bell to Cook 39–39

Mar.11, Post to McCurdy 40–40

Mar.11, Bell to Curtiss 40–40

Mar.11, Curtiss to Bell 40–40

Mar.11, Bell to Curtiss 40–40

Mar.12, Curtiss to Bell 40–40

Mar.12, Bell to Curtiss 40–40

Mar.12, Bell to Curtiss 40–40

Mar.13, Sydney Post to Bell 40–40

Mar.13, Bell to Sydney Post 40–40

Mar.13, Bell to Sydney Post 41–41

Mar.13, Sydney Post to Bell 41–41

Mar.13, Aero Club to Bell 41–41

Mar.13, Bell to Aero Club 41–41

Mar.14, Aero Club to Bell 41–41

Mar.15, Bell to Aero Club 41–41

Mar.15, Bell to London Times 42–42

Mar.15, London Times to Bell 42–42

Mar.15, Bell to London Times 42–42

Mar.15, Bell to Associated Press 42–42

Mar.15, New York Times to Bell 43–43

Mar.15, Bell to New York Times 43–43

Mar.16, Canadian Club (Ottawa) to Bell 43–43

Mar.16, Bell to Canadian Club (Ottawa) 43–43

Mar.17, Cook to Bell 43–43

Mar.17, Bell to Cook 44–44

Mar.17, Bell to Canadian Club (Ottawa) 44–44

Mar.17, Canadian Club (Ottawa) to Bell 44–44

ILLUSTRATIONS .

starts the engine by turning the propeller behind. Bedwin and this man then take their places on either hand behind the whirling propeller. Bedwin is on the left (starboard side of the aerodrome). All await a signal from Bedwin to let go. Bedwin raises his hand: The men in front let go and duck down allowing the machine to pass over them. The photographer also caught the signal and exposed his plate with the result here shown.

The lower photograph, taken Mar.16, shows McCurdy and the Silver-Dart in the air 28

1

EDITORIAL NOTES AND COMMENTS.

Patent Specifications.

March 19, 1909: — Two applications for U.S. Patents on the Hammondsport work of the Association have been completed and are now ready to be filed in the Patent Office as soon as the inventors have signed them. One of these is in the name of Frederick W. Baldwin alone; and the other is a joint application in the names of all the members of the Association (including Selfridge).

Last night (March 18) Mr. Baldwin signed his application, and swore to it before Mr. H. Percy Blanchard, Notary Public; and the joint application was signed and sworn to, before Mr. Blanchard, by DR. Bell, Mr. B l a ldwin, and Mr. McCurdy.

The joint application will have to be forwarded to Mr. Curtiss for his signature, and then sent to Mr. E.A. Selfridge in California.

Both applications will be mailed to-day (March 19) to Messrs. Mauro, Cameron, Lewis & Massie who will attend to the matter of getting the signatures of Mr. Curtiss and Mr. Selfridge. A.G.B.

CONFERENCE WITH THE CANADIAN GOVERNMENT.

March 19, 1909: — I have received an invitation to lunch with the Canadian Club of Ottawa on Saturday March 27 at one o'clock and address the Club on the subject of our experiments.

2

2 I have accepted the invitation, as I think it to the interests of the members of the Association that I should do so even at the expense of interfering with our closing experiments.

I will not only have the opportunity of addressing a distinguished and representative audience constituting indeed a National gathering of Canadians, but will also be able to secure a private conference with the Gov. General of Canada (Earl Grey), and with the Premier, Sir Wilfred Laurier and the members of his Cabinet on the subject of our work. I believe that important developments of the greatest consequence to the members of the A.E.A., will result from this conference. I would ask the members of the Association to consider this communication as confidential for the present. A.G.B.

SCIENTIFIC AMERICAN TROPHY .

March 19, 1909 :— Until recently I had been under the impression that the Scientific American Trophy would be awarded for the second time on much the same lines as on the first occasion excepting that the condition of distance flown would be more severe.

We had reason to believe, from verbal communications that have passed between some of our members and the President and other officials of the Aero Club of America that the Trophy would be awarded to the first flying machine in America to make a public flight of 25 kilometers under test conditions to be prescribed by the Aero Club; and that the award would be made immediately upon the fulfillment of the 3 3 conditions.

Believing that the Silver-Dart could fulfill the requirements we made application for the award; and agreed to pay the traveling expenses of representatives of the Aero Club from New York to Baddeck and back.

After receipt of our application, and in consequence of it, the Directors of the Aero Club held a meeting in New York to decide upon the test conditions. Upon this occasion however they took the opportunity to make a radical change in the understanding at which we had informally arrived; and this has led me to withdraw our application.

The Club now proposes to award the Trophy to the machine that shall make the longest flight over 25 kilometers during the year 1909. This means:—

(1) The award will not be made until after the close of the year 1909.

(2) Although we should actually succeed in making the prescribed flight of 25 kilometers this would not secure to us the award; for, should a longer flight be subsequently made by the Wright Brothers, or others during the year 1909 the award would go to them.

(3) I did not feel justified in incurring the expense of paying the traveling expenses of the representatives of the Aero Club on the almost absolute certainty that the award would be made to others.

(4) The status of the Association in the matter would be lowered by accepting under the present conditions. Instead of receiving the award as an honor comemorating our success in flying a distance of 25 kilometers we would be entering into a racing match in competition with others. This would place us in a position that would be derogatory to the best interests of a scientific Experiment Association.

4

4 (5) It would not be sufficient for us to fly the required distance of 25 kilometers which is only the minimum but we would be expected to go as far further as possible so as to demonstrate the full capabilities of the machine.

We certainly had no intention of exhausting either the machine or the aviator or running any risks whatever. While we could easily fly 25 kilometers without any strain on the machine or the aviator especially if we had Curtiss with us to tune up the engine, it would not be advisable for us to run into extremes and bring out the full powers of endurance either of aerodrome or man. The man of course is more important than the machine and the indisposition produced in Douglas McCurdy by a flight of only a few miles by being subjected to a cold wind of 40 miles an hour produced by the advance of the machine warns us that an endurance test of the kind suggested might be fraught with serious consequences to the aviator.

These are in brief the reasons that have led me to withdraw our application for the award. A.G.B.

Drome No.5, Bell's Cygnet II.

March 19, 1909 :— Drome No.5, Bell's Cygnet II has not yet demonstrated its ability to fly by leaving the ice.

There are various conditions however that show that we have not yet fully utilized the means of propulsion at our disposal. First, the engine has not been working well so that we did not have the benefit of its full power; and secondly, the calculation of Mr. Baldwin given elsewhere in this Bulletin shows that we are only utilizing in the propulsion of the machine a small portion of the power we possess, and that it would be possible to increase very materially the efficiencyy of propulsion by a different 5 5 propeller.

Taking the available power of our nominally 50 H.P. engine at only 21 H.P. which seems to be justified by our experiments, Mr. Baldwin's calculation shows that we are only utilizing about 7 H.P. in the propulsion of the Cygnet, 14 H.P. being employed in churning up the air behind into aerial foam. This shows that we may hope to produce a great improvement by constructing a new propeller as suggested by Mr. Baldwin having a larger surface in the propeller blades and a smaller pitch.

The present propeller is 9 ft. in diameter and has a pitch of 10 feet. We are now having a new propeller made with a diameter of 10 feet and a pitch of 5 feet. A.G.B.

6

EXPERIMENTS : Reported by the Editor.

Oionos Kite with Aero-curves .

March 13, 1909 :— The horizontal surfaces or aeroplanes of the White Oionos Kite have been converted into aero-curves by the insertion of curved aluminum tubes under the surfaces.

This kite, in its original form was tried Feb. 13 and yielded an efficiency of 2.4, the lift being 2.4 times the drift (Bulletin XXXIV p.18).

To-day (March 13) the same kite was tried with its aeroplanes converted into aero-curves with the object of testing whether curved surfaces would be preferable to flat surfaces in Drome No.6, which is to be of the Oionos type.

The Kite weighed 44.2 lbs; and was flown by a Manilla rope 100 meters long, weighing 10.7 lbs, attached at a point 50 cm in advance of the center of the kite.

Exp.1 Wind 12.20 mph Pull Alt 60 44 50 43 35 45 30 47 25 38 45 32 50 28 55 31 45 40 25 43 420 391 Exp.2 Wind 10.05 mph Pull Alt 30 46 20 44 40 40 30 45 10 48 15 46 10 38 15 33 40 32 15 28 225 400 Exp.3 Wind 9.50 mph Pull Alt 30 45 30 40 30 39 15 32 20 24 25 41 30 48 55 49 40 48 45 45 320 411 7

SUMMARY .

Pull Alt Wind Obs Lbs Obs Angle Obs mph Exp. I 10 420 10 391 1 12.20 Exp. 2 10 225 10 400 1 10.05 Exp. 3 10 320 10 411 1 9.50 Summation 30 965 30 1202 3 31.75 Average 32.2 lbs 40°.1 10.58 mph

EFFICIENCY .

Alt 40° 00‘ Sin .643 Cos .766

Pull 32.2 lbs. Vert 20.7 lbs horiz. 24.7 lbs

Lift.

Weight of Kite 44.2 lbs

Weight of line 10.7 lbs

Vertical Pull 20.7 lbs

Total 75.6 lbs

Efficiency Lift/Drift = 75.6/24.7 = 3.1

Comparison.

Oionos Kite Efficiency

with aeroplanes 2.4

with aero-curves 3.1

Result: Curved surfaces are more efficient than flat surfaces. In the above experiments 30 observations of altitude and pull were made; and in the following tables the observations are arranged according to altitude.

8 3 Grouped No of Obs Summation Average Altitudes Alt Pull Alt Pull 20°–29° 3 80° 85 lbs 26°.7 28.3 lbs 30°–39° 8 275° 235 lbs 34°.4 29.4 lbs 40°–49° 19 847° 645 lbs 44°.6 33.9 lbs Total 30 1202° 965 lbs 40°.1 32.2 lbs Grouped No of Obs Averages Altitudes Alt Lift Drift Efficiency 20°–29° 3 26°45‘ 67.6 lbs 25.3 lbs 2.7 30°–39° 8 34°30‘ 71.5 lbs 24.2 lbs 3.0 40°–49° 19 44°30‘ 78.7 lbs 24.2 lbs 3.3 Total 30 40°00‘ 75.6 lbs 24.7 lbs 3.1

Result: — The efficiency seems to increase with the angular altitude of flight. A.G.B.

9

EXPERIMENTS WITH CYGNET II .

March 15, 1909: — Experiments were made this morning to fly Drome No. 5, Bell's Cygnet II, with the Curtiss No.3 motor, and with a 9 foot propeller, a perfect screw, pitch 10 feet.

The sledge-runners had been bent, the vertical rudder placed under the front control, and the seat for the aviator raised 50 cm. These changes were shown in photographs in Bulletin XXXVI p.39, and also in this bulletin.

Bedwin reported that the push of the propeller had been tested upon the ice-boat, and found to be about 200 lbs.

The Cygnet II did not rise into the air, the speed attained not being sufficient for support.

Baldwin reported the following observations of speed over the ice on a measured course: —

Against wind 1/12 of a mile in 23.4 sec.

With wind 1/12 of a mile in 16.4 sec.

This was 12.8 miles per hour against the wind, and 18.3 mph with the wind. If x be the velocity of the wind in mph then:—

$12.8 \pm x = 18.3 - x$

x = 2.75

This indicates that the velocity of the machine relatively to the air, or in other words the velocity of the Cygnet II in a calm under her own propelling power, was about 15.55 miles per hour. The engine did not, I think, develop 10 2 her full power, for most of the time I could hear the engine skipping, one cylinder missing fire occasionally and then exploding with a bang.

The calculated velocity of the wind, 2.75 mph, tallies very closely with an observed velocity of 3 miles per hour taken with an anemometer.

For further details concerning the experiments with Cygnet II see my press despatches in this Bulletin. I give below accounts by Mr. McCurdy, Mr. Baldwin, and Mr. Edw. Geoff. Stairs. A.G.B.

McCurdy's Account :— This morning (March 15) the Cygnet II was tried out having been fitted with the new 9 foot diameter 10 foot pitch propeller, geared 2-1. The engine did not work well in the start, but picked up well developing about 30 H.P. after a few seconds running.

We ran her up the Bay starting from Long Sand Point. The first few seconds run was over a measured course of 1/12 of a mile. Over this she was run “flat”, the time being taken by Baldwin. Upon elevating the control the machine responded and lifted back on the rear of her runners. We ran up the Bay for about ½ mile, then stopping turned her round and returned under her full power. The time over the ½ mile course was now also measured.

Mr. Bell suggested that as the day was good the engine be transferred to the Silver-Dart, and a few flights made. The transfer was made in one hour and 15 minutes.

J.A.D. McC.

11

3 Baldwin's Account :— Tried No.5 this morning (March 15). Weather perfect, and ice fairly good though not quite as smooth as on some former trials.

On course of 1/12 mile took time with and against wind which was about 3 miles per hour. Speed was somewhere in neighborhood of 15 miles per hour, and machine would not lift.

Mr. Bell ordered engine to be shifted to Silver-Dart which was done before noon hour. F.W.B.

Stairs Account :— Monday (March 15), the Drome No.5 Bell's Cygnet II was tested on ice of Baddeck Bay. Present:— Dr. Bell and Staff, Dr. McDonald, Mrs. McDonald, Mr. Stairs, and a number of Baddeck men. Machine was taken from shed to a position off Long Sand Point, and after adjustment, the aviator, J.A.D. McCurdy took his seat.

At 9.20 A.M. the engine was started but the effort produced no result in as far as causing Drome to advance. Sound of operation of engine seemed to a lay observer somewhat “jerky” or intermittent , with an exhausting and omitting sound, causing me to think that the engine was not giving off its best; which also seemed obvious. Engine was stopped and three minutes spent in adjustment, but on resuming, the blank exhaust sound continued with somewhat varied noises till propeller stopped. McCurdy left seat and examined engine, adjusting the connecting plug ends of the transmission wires. McCurdy and Bedwin took their position inside framework and connecting wires surrounding engine, and caused a “try out? of the engine, the Drome being kept 12 4 stationary, they remaining along side engine for observation and adjustment of the mechanical apparatus.

At 9.45 aviator resumed seat, and start of Drome was accomplished gliding to a point say 100 feet forward, heading slightly to the left. Drome was shoved back a short distance, and started off again. Drome glided forward in straight line about, say, one-quarter of a mile, coming to a finish off Dr. Bell's Observation Point on the small island.

Another trial resulted in Drome going forward say 300 yards, curving quite considerably to the right, towards shore, till it finished glide.

At 9.55 another start resulted in, say, 200 yard glide till concluded about, say, 60 feet from two small ice ridges on hummocks. Men pushed her over the ice and some adjustment of power batteries was about to be undertaken when Dr. Bell having come up, advised that no further time be spent in the test, as it was evident that engine was not powerful enough to produce needed speed to cause Drome to "get into the air"!!

Drome was reversed, and at 10.15 started back over and down the course towards original starting point, making a continuous glide of three-quarters of a mile.

Dr. Bell had driven down course in advance, and at a point about three-quarters of the distance covered, when off Dr. Bell's sleigh, Drome was seen to glide forward on rear runners, as result of the aviator causing front control to rise slightly which rear runner support continued towards 13 5 final concluding point, say, 300 yards beyond Dr. Bell's sleigh, when Drome had, as above stated, made a glide continuously for say, about (or slightly over) three-quarters of a mile.

Being at first starting point, operations were discontinued, and on Dr. Bell's advi c e Drome was taken to shed, to have engine transferred to Silver-Dart for tests of latter during afternoon.

Tests of speed observations, of length of glides, etc., etc. were made, photographs taken, and other data gathered for future reference.

Day seemed an ideal one, bright and practically calm, with very faint breaths of air coming down the Bay.

Above "observations", respectfully submitted by: Edw. Geoff. Stairs.

EXPERIMENTS WITH SILVER-DART.

March 15, 1909 :— After the experiments with the Cygnet II this morning the engine was transferred to the Silver-Dart, and her own propeller (7 ½ feet diameter I think) was attached.

This afternoon the Silver-Dart was taken out on the ice and tried. The engine was skipping a good deal as in the morning experiments, and the Silver-Dart failed to rise.

Several unsuccessful trials were made suggesting to my mind the possibility that the failure of the Cygnet II to rise might also have been due to the engine as much as to the head resistance of the structure itself.

14

6 The engine was then given a thorough overhauling, and I left for the Point as I had been up all night and needed sleep.

The wind began to rise; and by the time all was ready for another test there was a breeze of from 10 to 14 miles per hour. Undeterred by this McCurdy attempted a flight and the machine rose from the ice.

He dromed the greater part of the way to Baddeck the machine pitching on the invisible billows of the air like a boat on the surface of the sea, giving him great experience in the handling of his controls. As I did not see this flight myself, I give below the accounts of McCurdy and Baldwin:— A.G.B.

McCurdy's Account: — About 2 o'clock (March 15) the Dart was taken out but difficulties with the motor prevented our trying a flight till about an hour had elapsed. By this time the wind had come up and the anemometer showed a velocity of 8–14 miles per hour. It was very puffy but it was thought that the experience in flying in such weather would be of good advantage, so finally after a few failures to rise, the engine was tuned so as to turn over

1000 rpm. This time the machine flew well and after arriving at Baddeck, I slowed down the engine landing on the ice and effected the turn. Advancing the spark resulted in the machine taking the air and away we flew, down the Bay with the wind till just off Carruth's when we stopped the engine. By this time the puffs were stronger and after a short flight of about ¼ of a mile against the wind the machine was safely landed 15 7 and wheeled back to her shed. It was thought advisable not to try again.

I may say that the controls all showed their ability to maintain the machine on an even keel, and the flight down from Town with the wind was the most exciting one I ever negotiated. J.A.D. McC.

Baldwin's Account :— After lunch took out Dart and after an hour's engine trouble John made short flight ½ mile or so. Radiator boiled from previous running. Wind was blowing very puffily at average of 10.5 miles per hour. Took several observations, 7 second ones. 8, 8.5, 10 and 13.5 miles per hour being some of the readings.

The aerodrome was very uneasy in wind making quick little dives and recoveries which made her look like small boat bobbing up and down in choppy sea.

Wind got worse. Experiments given up for day. F.W.B.

16

ON THE PUSH OF AN ADVANCING PROPELLER .

March 17, 1909 :— It was reported at one of our conferences that Maxim had declared as the result of numerous experiments with his large machine, that the thrust of a rapidly rotating propeller was the same whether the machine was advancing or whether it was at rest. Our experiments seem to indicate that the thrust of the propeller was less when the machine was in rapid motion than when it was still.

As our ice-boat, fitted with McCurdy's coiled spring indicator, advancing over the ice at 30 or 40 miles an hour, seemed to be admirably fitted to settle this question I directed Mr. Bedwin to make observations upon the point when he could do so conveniently without interrupting other experiments. I wrote to him upon the subject Feb.12 but he has been unable to make the experiment until to-day. I give below the correspondence on the matter.

Bell to Bedwin .

Feb. 12, 1909:— The experiments with the motor-driven ice-boat have not yet given us a satisfactory and definite answer to the important question:— Is the push of a rotating propeller the same when the machine is stationary as when it is in rapid motion?

I would be much obliged if you would make a series of experiments to test this single point. Don't complicate matters by attempting to note the velocity of the machine or the velocity of the wind. We want the push alone with the direction in which the machine is heading. I enclose a blank form for noting the results of the experiments.

(1) With the machine heading down the harbor but held still start up your engine and note the push.

17

2 (2) Then let her go and note the push while going full speed down the harbor.

(3) Then turn her round heading up the harbor and note the push when the machine is held still.

(4) Then let her go and note the push when she is going full speed up the harbor.

This will constitute experiment I. Repeat the experiment a number of times. I want at least five repetitions but will be still better satisfied with ten.

(Signed) Alexander Graham Bell.

Bedwin to Bell .

March 17, 1909 :— I beg to submit the following observations of propeller thrust on ice-boat, in answer to your letter of Feb. 12. The observations under heading “Still” are continuous steady push readings for one minute.

Then the engine was stopped and allowed to cool and started up again and the readings under “Moving” were taken during the time boat was getting under way and running over a course of about a half of a mile. The signs + and — indicate the direction in which the machine was heading. The wind was about 5 miles per hour.

Exp. 1 + Still Moving 115 100 75 75 75 65 70 65 60 70 70 Exp. 2 - Still Moving 125 105 100 80 75 75 75 70 70 75 75 18 2 Exp. 3 + Still Moving 125 100 90 75 75 75 75 75 75 70 70 Exp. 4 - Still Moving 125 100 95 75 75 75 75 75 80 75 70

(Signed) Wm. F. Bedwin.

The answer seems to be conclusive. The push of a propeller is different when the machine is advancing than when it is at rest. The push decreases with the speed. A.G.B.

19

EXPERIMENTS WITH THE SILVER-DART CONTINUED .

March 17, 1909 :— Douglas McCurdy started out this morning with the intention of making a sixteen mile flight to show that he could do the distance required as a minimum to win the Scientific American Trophy. The morning seemed to be ideal but the engine was not. He never had a more aggravating day. He put in several good flights but every time, after flying a few miles, the engine lost power and we have come y t o the conclusion that it is rather a fortunate thing that we had decided not to try for the Trophy under the new conditions imposed by the Aero Club. While we ? b elieve that the machine itself is capable of flying an indefinite distance for an indefinite time or so long as the engine and fuel will hold out it is very problematical what the result would be with the present engine we have. If Curtiss could only be here I have no doubt that he could easily arrange the engine so that it should run for the required time to make the required distance but in our hands, unassisted by Curtiss, it is a mere toss-up whether we could get the engine to do it.

I was not present on the ice to-day to witness the experiments but I watched the machine from the Point through a pair of field glasses, rounding the four mile mark about a mile beyond Stony Island in St. Patrick's Channel and kept her in sight until she disappeared behind Kidston's Island. On this occasion she did not reappear at the other end of the island and I could no longer hear the whirl of the propeller 20 2 from which it became obvious to my mind that something had happened. I then saw through my glasses spectators coming down on to the ice and proceeding in the direction of Baddeck evidently going towards the machine. I imagined a crow ? d collecting and examined the actions of the people on the ice to see whether I could obtain any indications of excitement to show whether an accident had occurred. All the people seemed to be walking leisurely along without any trace of excitement so I presumed that there had been no accident but that the power had given out and that McCurdy had landed in Baddeck Harbor. To make sure I telephoned to McKay's to find out what had happened and they simply reported that McCurdy had made a fine landing near one of the wharves. They evidently did not know that he was obliged to land. Later he proceeded down Baddeck Bay on the ice but I did not see him.

I hear afterwards that he had been in the Doctor's hands and that the Doctor had taken him to his office as he had been quite overcome by the cold. McCurdy himself was quite reticent as to what had happened and I could find out nothing from the Laboratory staff excepting that when McCurdy returned to a point near the Laboratory he got out of the machine and went at once to Dr. McDonald's sleigh, got in and immediately dropped asleep. This McCurdy indignantly denied, but I could not get any information out of him as to what had really happened and so I asked Mr. Stairs to give me an account.

The whole day, both morning and afternoon, was spent in experiments with the Silver-Dart. Numerous short ? f lights were 21 3 made and at least three flights of four miles or more. The engine seems to have acted capriciously throughout. I give below the account submitted by McCurdy and Baldwin and the note from Mr. Stairs describing McCurdy's half frozen condition. A.G.B.

McCurdy's Account :— This morning (March 17) we anticipated that a flight of 16 miles (measured) would be made with the Dart. A beautiful day with no wind to speak of.

T S tarted at usual place and flew well till off Baddeck when the power died dropping the machine to the ice. I however kept on and after a few seconds run on the ice she picked up and brought me to the end of the four mile course. Here she landed again while the turn was negotiated. Soon however she flew again and brought me to Baddeck, and from there home it was a series of jumps. Examination showed that one carbureter had become frozen and it was replaced by another one.

This time practically the same thing happened, but the engine stopped entirely stranding me at Baddeck on the return flight. It was found that the buzz was weak and upon testing the batteries only 9 amperes were registered. We intend trying a new set of batteries this afternoon and have them packed in cotton waste to keep off the intense cold. J.A.D. McC.

This afternoon (March 17) with the new set of batteries packed in cotton waste we felt almost sure that the long flight so much desired would be accomplished.

22

4 The engine worked well in the shed but upon attempting a start on the ice the usual unsatisfactory working of the engine took place. After about an hour had been lost in tuning the engine she was released, but quite a strong puffy wind from the NW had sprung up which ? m ade the management of the Dart rather difficult.

Just off the old church the engine stopped. I looked things over but could find no cause for this, and so, with Mr. Benner's single help, got the machine started again. However, when off Dr. McDonald's, one side of engine refused to run and so Dart landed. By this time the crew on the power ice-boat arrived on the scene, and we decided that the carbureters had better be looked over carefully in case some dirt had become lodged in the valves. This was done and some dirt removed.

After a little tuning the machine was for the third time started and flew up the shore for about two miles, when after making the turn, overheating brought the machine to the ice again. Help soon came and after waiting sufficient time for cooling to take place the home stretch was nego ?a? tia ted in a very rotten way touching the ice at close intervals.

It was decided to suspend experiments for the afternoon and wait for the engine to get well. J.A.D. McC. Baldwin's Accoun t:— John made two flights this morning (March 17). Engine started off well in each case but faded away before John could cover Stony Island course.

The second of these attempts looked very promising. The start was the best I have seen. However John could not keep up and stopped off Baddeck on return. Batteries were 23 5 weak. F.W.B.

John tried several times this afternoon (March 17) to make a long flight. After finding batteries weak this morning, it was thought that a new set would keep engine working O.K. However, on each occasion engine faded after short flights had been accomplished, and experiments were given up about 4.30 P.M.

The wind was decidedly strong and puffy during one of these flights, and the Silver-Dart did a good deal of jumping about. F.W.B.

Stairs Report on McCurdy's Condition :— After Silver-Dart finished flight of approximately 20 minutes from the time of starting (March 17) the writer, on going up to the machine stationary on the ice, noticed McCurdy in Doctor McDonald's sleigh, and on going to the sleigh, observed that Douglas was apparently quite fatigued, he leaning back in a loose, limp manner, his hands hanging somewhat loosely at his side, and altogether to a casual observer gave the appearance of his either being faint, or exceedingly weary.

On speaking to him he made no response, which indicated that he was either partially (if I may use the expression) unconscious , or if not in that condition, was too far fatigued to reply or even to nod an assent or dissent to a question. At the time the Doctor was testing his right hand pulse and chafing his wrists.

A moment later Baldwin spoke to him, and Douglas again did not seem to either hear, or if hearing, in any way acknowledge the remark, finally however, just barely speaking in an under tone in a brief and jerky manner.

24

6 In the course of another moment or two another observer made a remark to him which he answered more vigorously by casually remarking that “he did not care”. Then the Doctor suggested that they go in the sleigh to the Doctor's office and they started off.

As they went, the writer and Mr. Baldwin and others just didn't know what to think of Douglas' condition, though none of us were worried very much, feeling that if it was simply faintness he would pull through, or if it were cold it would pass over.

Possibly 20 or 25 minutes later when the Doctor and Douglas returned, he was in better shape, and on enquiry told me that his sensations, on coming from the machine, were those of an extremely cold man. He had not realized how cold he was while in the air, or running along on the ice towards the final stop; but on leaving the seat the coldness seemed to be emphasized in him.

He went forward to the Doctor's sleigh, and on having taken his seat, said, that for awhile he was bitterly cold which caused the appearance and desire ? o f extreme fatigue or exhaustion. He said that after being in the sleigh for a moment or two, covered with a buffalo rug along side Dr. McDonald that he broke into a violent perspiration, which later he remarked the Dr. had said was caused by the action of the blood which had been more or less congealed forcing itself forward and outward through the pores.

As a result of “a little something” that Douglas and the Dr. had while in Baddeck (a prohibition town!), he seemed 25 7 to resume his former state, and on arriving back where the machine was, said he felt all right, which was evident in a few moments by his activity.

Dr. Bell has suggested to me that I, as an observer, should put it in this way for his information. E.G. Stairs.

There is no doubt in my mind that Douglas McCurdy's temporary indisposition was due to the extreme cold to which he had been subject, and to his great disappointment over the unsatisfactory condition of the engine which had prevented him from making his desired flight of 16 miles.

He finished off the afternoon by taking part in a vigorous game of hockey on the ice (Beinn Bhreagh Laboratory vs.Baddeck) and helping to win the game. This certainly helped to restore his circulation and his spirits.

In the evening he gave a lantern slide exhibition to the men, and tumbled off to bed at eleven o'clock, and was asleep almost the mo ?? me nt his head touched the pillow. A.G.B.

EFFECT OF COLD ON BATTERIES.

March 17, 1909 :— After the forenoon experiments withthe Silver-Dart Mr. Baldwin, having noticed that the Voltaic batteries employed to produce the ingnition spark on the engine seemed to be weak decided to make a little experiment of his own to test the effect of cold upon the strength of the battery verifying or disproving the results of experiments reported by Bedwin in Bulletin XXXII pp.14–19.

I find the following note by Baldwin concerning this experiment:—

26

8 “Took old set of 4 dry cells. Amperage 15, temperature 120° Fah. at 12.15 noon. Put them out in snow bank.At about one o'clo ? c k amperage was 13, temperature registered by thermometer 30° Fah. F.W.B.

The battery cells were left out in the snow bank all the afternoon and at 6 P.M. I found the amperage 11, temperature 23° F. The cells were then left out all night. At mi n d night amperage 11, temperature 21° F. A.G.B.

March 18, 1909 :— We all of us forgot to look at the batteries this morning, but this afternoon we found them covered with melting snow, and brought them into the house, and tested them. The amperage 11. The batteries were placed at two o'clock near the open fire in my Study and by 3.30 P.M. the amperage had risen to 16. The fo o l lowing table shows the results:—

Temp. Amperage March 17 12.15 noon 120° F 15 cooling 1.00 P.M. 30° F 13 cooling 6.00 P.M. 23° F 11 cooling Midnight 21° F 11 March 18 2.00 P.M. 32° F 11 warming 3.30 P.M. 16

A.G.B.

27

1909 MAR 15

138667-A 28 138278-A 29

THOUGHTS CONCERNING MOTIVE POWER: By J.A.D. McCurdy.

March 12, 1909: — It seems to me that in obtaining a motor with which to propel a flying machine such as a tetrahedral structure, we should have these three points in view and their importance is in the order named. (1) Reliability, (2) Brake Horse-Power, (3) Weight.

It has been considered that the first requisite for such a motor is one of light weight and to naturally obtain greatest horse-power consistent with that weight. For instance if a motor should weigh, say, 400 lbs we might be liable to put that aside without more consideration because it is too heavy; we might not seriously consider that its great horse-power would more than compensate for its great weight.

A motor which will only produce a push of 200 lbs will as in the case of the Silver-Dart lift not only its own weight of 260 lbs but the aviator and machine making in all a total of 860 lbs. The landings made with this great weight are without jar or any shaking up to the machine.

Now in the case of the Cygnet what we must have above all other things is push, coupled with a certain definite pitch speed. This means horse-power. Now why should we try to install in this machine a motor which is of comparatively light construction and which produces not sufficient horse-power to drive the machine. The motor we have is a thirty horse-power motor and weighs itself 260 lbs. This is all right for a machine which only requires 30 H.P. to fly.

30

2 Now the larger you make a motor (within reasonable limits) the more it lessens per horse-power, or in other words a fifty horse-power motor of a certain design would weigh less per horse-power than a 20 or a 30 H.P. motor of the same design.

A motor having a certain cylinder capacity will develop a certain horse-power and the motor as a whole will weigh a definite amount. Now to increase the horse-power we must obtain greater cylinder capacity. As the area of a circle increases in proportion to the square of its diameter such a very little increase in the bore of a cylinder would greatly increase the capacity and horse-power. The weight of the material required for this increase in capacity would not increase proportionately to this increase in bore and hence the weight of the bigger motor as a whole would not increase in proportion to the horse-power. So we have a motor of less weight per horse-power than in the case of the smaller motor.

I would suggest therefore that if the Association contemplates the purchase of a new motor for the Cygnet let it be one of standard make and chosen according to the order of these requisites:— (1) Reliability, (2) Power, (3) Weight. J.A.D. McC.

31

THE HORSE-POWER WE ARE UTILIZING: By F.W. Baldwin.

March 19, 1909 :— A comparison of the useful horse-power employed in the propulsion of Dromes No.4 & NO.5.

The efficiency of a propeller is measured or rather should be measured by comparing the horse-power put into the propeller with the horse-power usefully expended in driving the machine.

When a machine is under way with uniform velocity the thrust of the propeller must necessarily equal the resistance of the machine otherwise there would be a plus or minus acceleration. Therefore the thrust in pounds multiplied by the distance through which the machine travels equals the work done by the propeller in ft. pds.

Now comparing the propeller efficiency of the Silver-Dart with the propeller of Cygnet II. The thrust in each case we judge to be in the neighborhood of 200 pds., but with this thrust the Silver-Dart travels at 40 miles an hour, while the Cygnet only travels at 15 miles an hour.

Silver-Dart .

Propeller thrust 200 pds.

Speed of machine 40 miles per hr. = 3520 ft. per minute.

Useful work done by propeller = 200 × 3520 ft. per minute.

= 200 × 3520/33000= 21.33 H.P.

32

CYGNET II.

Propeller Thrust 200 pds.

Speed of Machine 15 miles per hr. = 1320 ft per minute.

Useful work done by propellers = 200 × 1320 ft.

pds. per minute =200 × 1320/33000 = 7.10 H.P.

Allowing for transmission loses the H.P. delivered to propeller by engine is about 28 H.P.

Efficiency of Silver-Dart propeller =21.33 × 100/28.00 = 72.62%

Efficiency of Cygnet II propeller = 7.10 × 100/28 = 25.36%

Thus it is evident that the propeller used on Cygnet II is not well adapted for its work and while a pitch speed of 50 miles an hour may be necessary to fly Cygnet II it would seem that greater speed could be obtained by reducing the pitch speed either by increasing the area of the propeller blades and so cutting down their speed of rotation or by reducing the pitch.

The foregoing calculations assume that the thrust keeps up when under way. In case of Silver-Dart thrust may drop and so efficiency of propeller may not be quite as high as calculated but in any case it is clear that we are not getting more than 25.36% efficiency of propulsion with CygnetII F.W.B.

33

TELEGRAMS.

Bell to Post .

Baddeck, N.S., March 5, 1909 :— Cortland Bishop's letter to McCurdy just received. Would be glad to have you visit me here and officially observe experiments.

(Signed) Graham Bell.

Bell to M.C.L. & Massie .

Baddeck, N.S., March 6, 1909 :— Please forward patent applications for signatures at once if possible. Aerial Experiment Association ends March 31.

(Signed) Graham Bell.

Bell to Curtiss .

Baddeck, N.S., March 6, 1909 :— Please write fully concerning your arrangement with Herring and how it affects your relations with Aerial Experiment Association.

(Signed) Graham Bell.

Bell to Charles J. Bell .

Baddeck, N.S., March 6, 1909 :— Would like your views concerning commercial propositions in Bulletin XXXIV. Please write fully.

(Signed) Graham Bell.

Bell to Means .

Baddeck, N.S., March 6, 1909: — I would cordially welcome you to be my guest here and observe trial for Scientific American Trophy. Can you come? Telegraph reply.

(Signed) Graham Bell.

The above telegraph was also sent to Major George O. Squier and to Lieut. Lahm.

34

2 Aero Club to McCurdy.

New York, March 6, 1909 :— Can arrange to send representative later in month. Answer.

(Signed) Aero Club of America.

Means to Bell .

Boston, March 6, 1909 :— Many thanks. Very sorry to say it is impossible for me to leave Boston now.

(Signed) James Means.

Curtiss to Bell .

Hammondsport, March 6, 1909 :— Proposed Herring arrangement will not affect Association's plans. Letter to you to-day.

(Signed) G.H. Curtiss.

McCurdy to Aero Club .

Baddeck, N.S., March 6, 1909 :— Send representative as soon as possible. Ice our only chance. Will probably last through this month.

(Signed) J.A.D. McCurdy.

Post to Bell .

New York, March 6, 1909 :— Telegram received. Am considering possibilities of going. Will advise later.

(Signed) Augustus Post.

Lahm to Bell.

Washington, D.C., March 7, 1909 :— Sincerely regret official duties prevent accepting your kind invitation.

(Signed) Frank Lahm.

35

3 Baldwin to Mrs. Baldwin.

Baddeck, March 8, 1909 :— John made grand flight, eight miles in eleven minutes, fifteen seconds.

(Signed) Casey.

McCurdy to Post .

Baddeck, N.S., March 8, 1909 :— Silver-Dart flew eight miles in eleven minutes and fifteen seconds this morning. Made four other flights.

(Signed) J.A.D. McCurdy.

Bell to Mrs. Bell .

Baddeck, N.S., March 8, 1909 :— Douglas flew eight miles today in eleven minutes and fifteen seconds. He dromed to Stony Island and back, passing over Baddeck Harbor both ways.

(Signed) Alec.

Press Despatch .

Sent to Chas. S. Thompson, Associated Press, New York, Fred Cooke Correspondent of London Times Ottawa, Ont., W.R. McCurdy Halifax Herald, Halifax Chronicle, Milton Browne, Sydney Post.

Baddeck, N.S., March 8, 1909 :— The Aerial Experiment Association resumed experiments here this morning with Drome No. 4 McCurdy's Silver-Dart. Mr. Douglas McCurdy made five flights with the special object of practicing landing on the ice. After four short flights he attempted a longer excursion, and flew a distance of eight miles in eleven minutes and fifteen seconds. Starting from Dr. Graham Bell's Laboratory he dromed to Stony Island and back passing over Baddeck harbor both going and coming. The flight was witnessed by practically all of 36 the people of Baddeck, who were brought to their windows by the buzzing of the engine.

(Signed) Graham Bell.

Pfitzner to McCurdy .

Hammondsport, N.Y., March 8, 1909 :— Best congratulations.

(Signed) A.L. Pfitzner.

Morning Chronicle to Bell .

Halifax, N.S., March 8, 1909 :— Permit us to congratulate you on success of to-day's achievement and to thank you for Bulletin.

(Signed) Morning Chronicle.

Times Correspondent to Bell .

Ottawa, March 8, 1909: — Thanks for to-day's message. Your experiments arousing great interest in England.

(Signed) Fred Cooke.

Squier to Bell .

Washington, D.C., March 8, 1909 :— Regret exceedingly official duties do not make it possible to accept your invitation. Very many thanks.

(Signed) George O. Squier.

Ha ? l ifax Herald to Bell .

Halifax, N.S., March 8, 1909: — Thanks for despatch. We will be glad of more than what you sent on a great flight like that of yesterday.

(Signed) W.R. McCurdy.

Davidson to Halifax Chronicle .

Baddeck, N.S., March 8, 1909:— J.A.D. McCurdy, in his aerodrome Silver-Dart, made five successful flights over the ice on the Bras d'Or Lake remaining in the air, in one flight, eleven minutes fifteen seconds starting about a quarter of a mile below Dr. Bell's Laboratories. After running for a distance of seventy-five yards on the ice, the Dart ascended in the air to an elevation of about twenty feet keeping along the shore and went partly over the town of Baddeck for a distance of two and a half miles beyond, making a circular turn back over the same course and made a beautiful landing within twenty yards of the aerodrome shed flying over, in its course, people, horses, and ice-boats, in all covering a distance of over twelve miles in the flight. Mr. McCurdy said, in landing, the Wright Brothers had his greatest respect in remaining in the air for two hours twenty-three minutes. The Dart was in full control throughout the flights.

(Signed) J.G. Davidson.

Bell to Chas. S. Thompson (Associated Press, N.Y) .

Ma t r ch 9, 1909:— The Aerial Experiment Association decided today that the wind was too strong and puffy to render a long flight with the Silver-Dart safe or advisable. Mr. McCurdy theref ? o re simply practiced upon the ice making a series of short flights at a low elevation none of which exceeded a mile in length. In every case the landing was effected safely and gently and without jar to the machine or aviator.

(Signed) Graham Bell.

38

Mrs. Bell, Mr. and Mrs. Fairchild to Bell.

Washington, D. E C ., March 9, 1909 :— Can men be really flying. That which the world considered impossible has really been accomplished. Hurrah for Douglas and the Silver-Dart.

(Signed) M.D.D.

Stairs to Bell .

Mulgrave, N.S., March 9, 1909 :— Canadian Courier desires authentic article. Kindly have Douglas telephone me tonight Sydney Hotel, if convenient see me to-morrow.

(Signed) E. Geof. Stairs.

Curtiss to Bell .

Hammondsport, N.Y., March 10, 1909: — Congratulat n? io ns McCurdy's flight. Anxious for details. Preliminary Herring agreement signed.

(Signed) G.H. Curtiss.

Associated Press to Bell .

New York, March 10, 1909: — Many thanks for despatches concerning aerodrome experiments. Please continue them and expand freely in case notable flights occur always sending collect.

(Signed) Chas. S. Thompson.

Bell to Associated Press .

Baddeck, N.S., March 10, 1909 :— Mr. Douglas McCurdy made two flights this morning in the aerodrome Silver-Dart aggregating about 19 miles in all. The flights took place over the ice on Bras d'Or Lake along a measured course in a 39 straight line of four miles. This route is marked at half-mile intervals by spruce trees planted in the ice and passes through the harbor of Baddeck. The engine was removed this afternoon from McCurdy's Silver-Dart and experiments will now be resumed with Dr. Bell's tetrahedral aerodrome, Cygnet the second, the fifth aerodrome built by the A.E.A.

(Signed) Graham Bell.

London Times to Bell .

Ottawa, March 10, 1909: — Private. (The private part is here cut out). File early Thursday two hundred word description Cygnet in untechnical language far as possible to use with stor ? y of experiment. Shall be glad if you will file story of flight earliest possible moment. To-day's message too late for Thursday's Times owing to difference in time.

(Signed) Fred Cook, Correspondent of London Times.

Bell to Fred Cook .

Baddeck, N.S., March 11, 1909 :— Thanks for telegram. The Aerial Experiment Association will be dissolved March thirty-one as we feel that our researches have now gone beyond the experimental stage, and we are now discussing what to do commercially. This is private, not for publication. Cygnet description will follow later. No experiments to-day.

(Signed) Graham Bell.

40

Telegrams .

March 11 Post to McCurdy:— Heartiest congratulations from Club and myself. Rules formulated. Director's meeting to-morrow. (Signed) Augustus Post.

March 11 Bell to Curtiss :— Unless we can obtain 30 brake horse power from this motor we must order automobile engine at once. We are unable to get more than eight absolute horse power. What do you say? (Signed) Graham Bell.

March 11 Curtiss to Bell :— Is engine entirely wrecked or just out of order? Engine developed 35 H.P. when I left and must have been doing over 30 to make flights reported. Wire further information. (Signed) G.H. Curtiss.

March 11 Bell to Curtiss: — Nothing has happened. Simply can't get the power. Sometimes Dart flies, sometimes not. Margin too close at best. (Signed) Graham Bell.

March 12 Curtiss to Bell :—Conditions evidently require present engine man. I agree to be in New York for proposed organization next week. Can however send Pfitzner who tested engine and can be absolutely depended on to correct. Is this O.K. and if anything wanted. (Signed) G.H. Curtiss.

March 12 Bell to Curtiss :— Twenty-five horse-power this morning. Am telegraphing you before experiments are concluded in order to relieve your mind. (Signed) Graham Bell.

March 12 Bell to Curtiss :— Discovered trouble. Getting 31 H.P. to-day. Keep Pfitzner at home. (Signed) Graham Bell.

March 13 Brown (Sydney Post) to Bell :—Received following cable this morning:— London, England, Brown, Post, Sydney, N.S. Interview Graham Bell for thoroughly accurate scientific description aeroplane. Also ascertain if it infringes Wright's patents as regards flexible wings. Cable up to 300 words. (Signed) London News. Would you be kind enough to wire me something to cable them. (Signed) Milton Brown.

March 13 Bell to Brown (Sydney ? P ost) :—Glad to see you here. Too busy to prepare article. (Signed) Graham Bell

41

2 March 13 Bell to Brown (Sydney Post):— You may use the following upon the clear understanding that it is cabled strictly verbatim:— The Silver-Dart is a double surface machine of unique construction distinguished by the spar-like form of its frame which is deep in cross-section at the middle and tapers towards the ends.

This form of construction permits of bow-string wiring which converts the whole machine n i nto a rigid truss extremely light and with little head resistance.

It also leads to a novel and very advantageous arrangement of supporting surfaces, which are curved laterally, as well as in the fore and aft direction.

The lateral stability is controlled by balancing rudders which operate upon an entirely different principle from that adopted by the Wright Brothers securing lateral stability without any cooperation of the vertical steering rudder and without sacrificing rigidity in the main structure. (Signed) Graham Bell.

March 13 Brown (Sydney Post to Bell :—Thanks for telegram. Will cable as directed. (Signed) Milton Brown.

March 13 Aero Club of America to Bell :—Rules Scientific American Trophy adopted. Club will send representative if all expense paid. Answer quick. (Signed) Aero Club of America.

March 13, Bell to Aero Club of America :— Will pay expenses as suggested. Send representative as soon as possible. (Signed) Graham Bell.

March 14 Aero Club of America to Bell :— Telegram received. Cup for 1909 goes to aeroplane making longest flight above 25 kilometers during this year. Shall we send representatives. (Signed) Aero Club of America.

March 15 Bell to Aero Club of America :— The Aerial Experiment Association has been under the impression that the Aero Club of America would honor the first to make a public flight of 25 kilometers duly authenticated by representatives of the Aero Club by awa e r ding at once the Scientific American Trophy. Belie l v ing that Mr. Douglas McCurdy could fly this distance in our aerodrome Silver-Dart we applied for the Trophy. Finding however from your telegram received to-day that the Trophy is to go to the machine making the longest flight above 25 kilometers during the year 1909 we must under these conditions withdraw our application. We are purely and experimental Association and do not care to enter into competition or attempt to make the longest poss?l flight. (Signed) Graham Bell. Chairman of the A.E.A

42

3 March 15 Bell to Cook (London Times):— Unable to get Drome No. 5 Bell's Cygnet II into the air this morning. Speed over ice only 15 miles an hour. Not sufficient for support. The engine will now be transferred to Drome No.4, McCurdy's Silver-Dart with which experiments will be made this afternoon. (Signed) Graham Bell.

March 15 Co k c k (London Times) to Bell :— New York Despatch says representative Aero Club America left for Baddeck witness Silver-Dart's flight for Scientific American Cup. Is it intention contest for this cup, and if so with engine of Cygnet II. (Signed Fred Cook. Cor. London Times.

March 15 Bell to Cook (London Times) :— The engine was transferred to Silver-Dart this afternoon, and the Silver-Dart also failed to rise throwing doubt upon cause of non-success this morning with Cygnet II which may have been due to engine and not to head resistance of structure. After thorough overhauling of engine Mr. McCurdy made a fine flight in the Silver-Dart droming to Baddeck and back to Dr. Bell's Laboratory in spite of a puffy wind of from 8 to 14 miles per hour which tried the equilibrium of the machine and the ability of the aviator to control it. The Aerial Experiment Association understanding that Aero Club would honor first machine making 25 kilometers under test conditions by the award of the Scientific American Trophy, and believing that the Silver-Dart could fulfill the requirements made application for the award. The Aero Club however after receiving this application held a meeting and changed the rules deciding that the Trophy should go to the machine making the longest flight over 25 kilometers during the present year thus delaying the award and making it a matter of competition. Under these circumstances the Association has withdrawn its application. (Signed) Graham Bell.

March 15 Bell to Associated Press: — Experiments of Aerial Experiment Association were not very successful to-day. Drome No. 5, Bell's Cygnet II was tried this morning but speed attained not sufficient to support her in the air. Whether this was due to the great head resistance of the structure or to skipping of engine does not clearly appear for Drome No.4, McCurdy's Silver-Dart also failed at first to rise this afternoon. After thorough overhauling of engine the Silver-Dart made a good flight. Mr. McCurdy droming to Baddeck and back to Dr. Bell's Laboratory in spite of a puffy wind of from 8 to 14 miles per hour, which tested the stability of the machine. (Signed) Graham Bell.

43

March 15 New York Times to Bell :— Will you kindly state by wire your objections to the new rule for the scientific American Cup in connection with your refusal to try for it. (Signed) New York Times.

March 15 Bell to New York Times :— The Aerial Experiment Association understanding that the Aero Club of America would honor the first machine making 25 kilometers under test conditions by the award of the Scientific American Trophy and believing that Drome No.4, McCurdy's Silver-Dart could fulfill the requirements made application for the award. The Aero Club however after receiving the application held a meeting and changed the rules, deciding that the Trophy should go to the machine making the longest flight over 25 kilometers during the present year, thus delaying the award and making it a matter of competition. As the Association is an Experiment Association pure and simple it does not desire to enter into any competition and does not intend to try to make the longest possible flights with its aerodromes. It regrets the misunderstanding with the Aero Club in this matter and withdraws its application. (Signed) Graham Bell, Chairman, A.E.A.

March 16 Gerald Brown (Canadian Club) to Bell:— Canadian Club Ottawa would very muck like have honor your company at luncheon or dinner on date to be named by yourself and to receive address from you on recent development Science Aviation with which your name is associated. Canadian Club is non-political organization with membership one thousand including many members both Houses Dominion Parliament. Financial Minister Fielding, with whom I have discussed matter would attend well as other members of Cabinet and could promise you gathering thoroughly worthy of occasion. Club will bear all expenses of your trip and stay in Ottawa. (Signed) Gerald H. Brown. Hon. Secretary.

March 16 Bell to Gerald Brown (Can d a dian Club):— It would give me much pleasure to address the Canadian Club but could not leave here before Monday, April 4. Any later date will be convenient for me. (Signed) Graham Bell.

March 17 Fred Cook to Bell :— For reasons mentioned your private telegram last week would strongly urge acceptance of Ottawa Canadian Club invitation early in April. Gathering will be National one and might lead to important results. (Signed) Fred Cook.

44

March 17 Bell to Fred Cook :— Thanks for telegram. Will come any day March or April so long as I can be here Wednesday March thirty-one to preside at final meeting of Aerial Experiment Association. (Signed) Graham Bell.

March 17 Bell to Gerald Brown (Canadian Club) :— Since telegraphing I find I can address Canadian Club any day in March or April convenient to the Club consistently with my being here on Wednesday, March thirty-one to preside at final meeting of Aerial Experiment Association. (Signed) Graham Bell.

March 17 Gerald Brown (Canadian Club) to Bell :— After consultation with Fielding and other Cabinet Ministers find Saturday 27th March best date to bring together kind of company you would yourself prefer. One o'clock luncheon meeting also preferred to evening dinner. Please confirm by wire if these arrangements satisfactory. (Signed) Gerald Brown.

March 17 Bell to Gerald Brown (Canadian Club) :— Telegram received and it will give me pleasure to lunch with Canadian Club one o'clock Saturday, March 27. (Signed) Graham Bell.

March 17 Bell to Chas S. Thompson (Associated Press) :— The aerodrome Silver-Dart was on the ice all day. Mr McCurdy made numerous short practice flights including three four mile flights. He suffered considerably from the cold experiencing practically blizzard weather by being rushed through the cold air at 40 miles an hour. The people of Baddeck are becoming so accustomed to the flights that comparatively few p r e ople were on the ice to-day. (Signed) Graham Bell.

45

March 17 Davidson to Halifax Chronicle & Sydney Record :— The Aerial Experiment Association resumed experiments this week with Drome No.5, Dr. Bell's tetrahedral Cygnet II with Douglas McCurdy as aviator. Whether due to the head resistance of the structure or the inability of the engine to develop the power required the Cygnet failed to rise. The engine was immediately transferred to the Silver-Dart for a flight and the Dart in turn failed to rise on the first attempt. After a thorough overhauling and speeding of the engine another flight was attempted which proved successful and one of the most sensational flights Mr. McCurdy the aviator has yet accomplished. As a puffy wind varying from 8-14 miles an hour was blowing at the time, it gave the aviator an experience to test the stability of the machine as well as his ability to control it, which were both accomplished without a hitch and a flight of three miles made against and with wind. Mr. McCurdy made several flights to-day over a measured course on the ice but in each flight the engine was working very unsatisfactorily, and Mr. McCurdy made a landing on the ice in each flight before he covered the eight mile straight course covering a distance of

16 miles in flight. The wind was again very unsteady. For recreation and to clear their minds off flying machines for the day a pleasant game of hockey was played between Dr. Bell's Laboratory Staff including the aviator and Baddeck Club. Result 3 to 1 in favor of Laboratory. (Signed) J.G. Davidson.

March 18 Bell to Associated Press :— Mr. F.W. Baldwin, Chied Engineer of the A.E.A. made this evening at dusk a flight in Drome No.4, McCurdy's Silver-Dart. This is the first time the Drome has been tried by anyone except Mr. McCurdy. (Signed) Graham Bell.

46

SELFRIDGE TO A.E.A .

San Francisco, Cal., Feb. 27, 1909 :— I am pleased to acknow e l edge Bulletins Nos. XXX, XXXI, XXXII.

They indicate much work and patience in the great problem you are laboring to solve.

Will you express to Mrs. Bell my grateful appreciation of her loving and touching commemoration of Tom.

(Signed) E.A. Selfridge.

Curtiss to Bell .

Hammondsport, N.Y., March 5, 1909: — I wired John last night briefly about the trials for the Trophy and my affairs in New York. I looked Mr. Post up immediately on arrival and talked the thing over with him, but it seems that Mr. Bishop has assumed full management of the Club's affairs. I saw him Tuesday and was talking with him when he received John's letter, which he immediately answered. It seems that he is changing the rules for the Cup Trial, but he would not tell me what the new conditions would be. I asked him to write Mr. McCurdy in full. He assured me that he would be glad to have the trial made there, and that a representative of the Club would be sent as observer if his traveling expenses would be paid, which is one of the new rules for Cup Trials made at a distance of over 25 miles from Club headquarters.

This however, is not a serious item as I take it that only one observer would be necessary. If conditions are right and you will wire direct to Mr. Bishop, I think that a man 47 2 will be sent on at once. It will be necessary to name a date, and I would suggest that three dates in succession be named. This is the way the Wrights did in France in making the trials for prizes. This gives them three chances for good weather.

Our party made the trip to New York without mishap, although we had to make a quick change at the Junction outside Montreal on account of the train being late. Mrs. Bell stayed a few hours in New York to see some friends, Mrs. Curtiss came on to Hammondsport and I remained in the city until Wednesday.

I found Mr. Herring quite anxious to close up the deal with me, and I finally made him an offer, a little better than his original proposition, which he verbally accepted. He has promised to come on to Hammondsport at once and make final arrangements. The announcement was made at the Aero Club Wednesday evening of the consolidation. Mr. Bishop represented the moneyed interests, and I understand that Mr. Hawley and Mr. Cooper Hewitt are among the others.

Mr. Herring showed me a great deal, and I would not be at all surprised if his patents, backed by a strong company, would pretty well control the use of the gyroscope in obtaining automatic equilibrium. This seems to be about the only road to success in securing automatic stability in an aeroplane.

If the deal goes through I will be manager of the Company and everything will go on just as it has, except that we will have Mr. Herring's devices on the machines which we 48 3 may build, which, by the way, recalls the fact that I accepted an order from the Aeronautical Society for an aeroplane to be delivered in the Spring at Morris Park, N.Y. I did this on my own responsibility with the idea that if the consolidation was made with Herring it would be turned over to the new company, or if a commercial organization succeeded the Experiment Association the order could be turned over to them. If neither of these materialized, the Curtiss Co. would endeavor to f ? i ll the order itself.

I am planning to go to Washington to see Mr. Charles Bell as soon as I am sure of the outcome with the Herring prop i o sition. There is no reason why the Aerodrome Company should not be formed if the Herring deal goes through unless the members of the Association would care to come into the Herring combination. This would please Mr. Herring I am sure, and I don't know but that it would be just as well for the Association. Mr. Herring was intending to write to you about the matter. You will probably have a letter from him within a day or so. I received John's message about the radiator and am pleased to learn that the square one did the business. A fan can be easily attached to the engine balance wheel to help out on the cooling, if necessary.

I find stacks of correspondence and matters requiring my attention and I will be busy the next few days in clearing this away. I will advise you of any further developments.

(Signed) G.H. Curtiss.

49

AVIATION. EXPERIMENTS BY CANADIANS.

(Extract from Hanzard, March 11, 1909). Canadian Parliment.

Mr. Sam. Hughes (Victoria and Haliburton). I notice from the newspapers that very successful experiments have been made by certain Canadians in aerial navigation and especially at Baddeck, in N.S., in the case of the invention of Mr. Alexander Bell, the eminent Canadian. I wish to know whether the government has taken any steps to recognize the advance of this science in Canada, and if not, is it their intention to take measures to encourage the science as in the case of the Marconi wireless telegraph system?

Hon. W.S. Fielding (Minister of Finance). We have the highest appreciation of the work that has been accomplished by Mr. Douglas McCurdy and also Mr. Baldwin of Toronto, who is associated with him in the work with Dr. Graham Bell. We have not, shall I say fortunately or unfortu ? n ately, any branch of our public service in which we could conveniently utilize the discoveries of these scientific gentlemen. Nevertheless we felt that we should take some notice of their achievements and for the present we have taken steps to draw the attention of the imperial government to them in the hope that the officials of the War Office and the Admiralty, who are now directing their attention to aerial navigation, may be able to avail of the services of these young Canadians and thus retain them for the benefit of the empire.

Mr. Hughes. Hear, hear.

50

THE OUTLOOK ON AVIATION : BY J.A.D. McCurdy.

It is with regret that we note the action of the Aero Club of America in relation to the application for the award of the Scientific American Trophy filed by the A.E.A.

From the standpoint of true sporting principles they are to be severely critized for making a change in the competitive rules after an application for trial has been filed and accepted.

If any such action on the part of the Aero Club was anticipated the change in the rules should have been made at an earlier date so that our application for the award could have been made with the full knowledge of the conditions under which the Trophy could have been won.

THE OUTLOOK ON AVIATION: By E.G. Stairs.

The Outlook on Aviation in Canada is indeed bright! History has been made in the last week, for Canada, as a nation; has in a more or less official manner taken note of the Science and art of aviation within the Dominion.

Col. Sam Hughes, M.P., Canada's keenest military critic and himself closely in touch with the Minister of Militia and military council, asked the Laurier administration on Thursday March 11, questions which were answered by Hon. W.S. Fielding Minister of Finance. The questions and answers are published elsewhere in this issue of the Bulletin.

We note an article on “Aviation in Canada” — “A National Organization proposed, and discussion invited” written for Motoring, of Toronto, by Dr. Mark G. McE?hinney of Toronto 51 2 for March (09) issue. It contains an interesting proposal concerning National Organization and concludes — “A fuller public discussion might lead to an ultimate solution”.

The present writer of th e i s brief note will, if permitted present his views on the matter raised by Dr. McElhinney in the next issue of the Bulletin. Possibly as one knowing the men of Canada from Coast to Coast and somewhat and somewhat closely in touch with general public opinion I may be so permitted.

(Signed) Edw. Geoff. Stairs, “The Outlooker”.

I have given below an interesting article translated from L'Aero ? p hile (Mar. 09) which shows a comparison of a few points concerning the Wright Brothers machine, and those constructed by the Voisin Brothers of France. J.A.D. McC.

THE WRIGHT AEROPLANE AND THE FRENCH AEROPLANES .

Diverse replies to M. Lefort's article which appeared under this title in L'Aerophile.

In this that concerns the act of launching it is evident that the actual method of the derrick and rail ought to be abandoned before very long. The Wright Brothers having worked up till now for experiments alone, without trying immediately to solve the question of a commercial use for a machine, had found the employment of the derrick and rail, which much restricted the space necessary for the flight simpler.

The work demanded of the derrick being furnished by the falling of 700 kgs. through a vertical distance of 5 meters 52 fall of which takes place in 3“# seconds (verified time) the power thus utilized corresponds to about 13 H.P. so M. Lefort states it thus:—

700 × 5/3“ . 4 × 75 = 13.7 H.P.

M. Lefort assumes to 1st, the equality of their speed. This equality does not exist, for if the average number of chronometer trials for each of the two types of machine is taken, a speed of 16 m per second is found for the Wright and 17 m 50 for the Voisin. This difference, which seems insignificent at the first sight, entails in fact an additional effort essentially demanded of the Voisin machine (about 20 0/0 more to pass 16 m than 17 m 50).

“....2nd. The equality of their resistances to penetration and on account of the propelling forces of their propellers”.

We are still much less agreed on this point for the two very characteristic advantages of the Wright over the Voisin are precisely: not such a great resistance to penetration on account of: 1st not such a great incidence of the planes when the machine is at its normal speed; 2nd not such a large surface detrimental to starting, shrouds, cross-pieces, cart etc.

The estimate made of these differences (calculated and verified by experience) shows that, for the same speed of 16 m per second given the two machines, the necessary effort of propulsion is only 83 kilos. for the Wright, whils't it reaches 110 kilos for the Voisin (and 127 k 5 to 17 m 50).

53

“....3rd. The following values of the absolute efficiency of the propellers: Wright 70 0/0; Voisin 60 0/0.

“...4th. That the speeds are proportional to the number of revolutions and to the diameters (?)...”

(This last proposition is not comprendible, we shall not occupy ourselves with it, besides it is not necessary for determining the efficiency.

In this which concerns the efficiency of the propellers, we shall estimate that of Wright at 75 0/0 and that of Voisin at 66 0/0; but we must not forget that the transmission by chain in the Wright entails a loss of power to the extent of 10 %. The total percentage of power transmitted by the shift of the motor to the propellers can then be figured by: 0.90 × 0.75 = 0.675 in the Wright and 0.66 in the Voisin. Otherwise these results can be considered as equal.

The great difference between the two types of machine reside, in fact, not at all in the propulsion (let us say in passing that we much prefer slow propellers to rapid propellers) but in the resistance to penetration, this difference is due to this, that in the Wright the rear edges of the planes is very supple thus dimin i shing the incidence in proportion as the speed of the machine increases, and provokes less eddy because of the special curve which takes these planes under the push of the air.

If then we look for the effective work demanded on the shaft of the motor in the two machines, in utilizing these rectified calculations, we find:—

54

For the Wright: Tt. = F × V/R = 83 × 16/0.675 = 1965 kilogrameters or 26 H.P.

For the Voisin: Tt. = 127 × 17.50/0.66= 3370 kilogrameters or 45 H.P.

These two horse-powers are substantially those of the two motors of Wright and of Voisin. Finally it seems to us that it would be preferable to compare the usefulness between those of the aeroplanes of different types, that is to say, the coefficient of utilization of an aeroplane is the ratio of the utilized weights transferred to the total weights, multiplied by the speed of advance (which is proportional to the space traversed) and divided by the free effective power on the shaft of the motor and expressed in horse-power.

The formula would be then:—

U = Pu × V/Pt × M

Let us apply this formula to the Wright and Voisin machines, we shall find:

U = 70 kgs. × 16 m/450 kgs × 26 H.P. = 0.096 for the Wright and

U = 140 kgs × 17 m 50/640 kgs × 45 H.P. = 0.085 for the Voisin

Remarks: We have taken 140 kgs as utilized weight in the Voisin, on account of the supporting chassis which it possesses (76 kilograms) and which would render ine ? x act the comparison with the Wright if allowance for it is not made.

55

The coefficient can still be calculated by adding the weight of this chassis of Voisin and calculate the addition of power which it would necessitate on account of the resistance to the air (about 70 kilogrameters). Thus would be found respectively as new values of U: 0.070 for the Wright and 0.043 for the Voisin. But the first solution (counting the chassis as weight utilized) may seem more just.

Our conclusion is then found to be the same as that of Lefort, but for quite different reasons, it is not the propulsion which makes the great advantage of Wright, it is the principle of construction of the supporting surfaces. G. Garnier.

J.A.D. McC.

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXXVIII Issued MONDAY, MAR. 29 190?

ASSOCIATION'S COPY .

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell Assistant Editor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletin of the Aerial Experiment Association .

BULLETIN NO.XXXVIII ISSUED MONDAY MAR. 29, 1909 .

Beinn Bhreagh, Near Baddeck, Nova Scotia .

TABLE OF CONTENTS .

Illustrations.

1. This picture shows the position that the two men would occupy in flying in the Silver-Dart (upper picture).

Rear view of power plant and operator of the Silver Dart (lower picture) March 17, 1909 22

2. Silver-Dart circling in Baddeck Bay. This also shows the Asst. Photographer about to take a picture. March 23, 1909.

3. Side view of Silver-Dart circling in Baddeck Bay, March 23, 1909 23

1

EDITORIAL NOTES AND COMMENTS .

The Gauldrie's Engine transferred to Ice-boat .

March 20, 1909: — The Buffalo Marine Motor has been taken out of the Gauldrie which is laid up for the winter and is now being transferred to the ice-boat in order to make a series of experiments upon the thrust of an advancing propeller. A.G.B.

Postponment of Further Flights with Silver-Dart and Cygnet II.

March 21, 1909 :— There is now open water on the Bras d'Or Lake excepting in sheltered Bays and an attempt is to be made to-morrow to cut out the Steamer Blue Hill from Baddeck Harbor so as to open navigation again.

As we fear that the good ice in Baddeck Bay may not last much longer we have decided to discontinue experiments with the Silver-Dart and Cygnet II for the present in order to secure some data concerning the thrust of an advancing propeller by experimenting with the power driven ice-boat. Upon the conclusion of these experiments the Silver-Dart and Cygnet II will be tried again if the ice still holds good on Baddeck Bay. A.G.B.

Departure of the Editor for Ottawa.

March 22, 1909 :— Men are hard at work upon the ice in Baddeck Harbor to clear a passage to open water for the Steamer Blue Hill. I propose to leave this afternoon for the Grand Narrows unless there seems to be a prospect of the steamer making a trip in the morning. I propose to leave 2 Grand Narrows to-morrow morning (March 23) for Montreal and Ottawa, returning here by the end of the month. I make an address before the Canadian Club of Ottawa on March 27. As I shall not be here when this Bulletin comes out, and the Asst. Editor is in Washington, I shall ask Mr. McCurdy, as Secre a t ary of the A.E.A. to take charge of the Bulletin with the assistance of Mr. Cox. A.G.B.

3

PROPELLER EXPERIMENTS WITH ICE-BOAT .

March 26, 1909 :— Our days for flying over the ice at Baddeck are practically numbered for weather conditions indicate that with the approach of early Spring the ice is fast breaking up and will soon disappear.

We must now turn our attention to the consideration of the plans, details of propellers, change of gearing etc., which we are to adopt in performing our experiments with the ice-boat having the Buffalo engine mounted thereon.

It was, I think, mentioned in a former Bulletin that the Smithsonian Institution had been asked to furnish us with the propeller tests conducted by the late Prof. Langley. I may say that it was a great surprise that we learned through Mr. Charles M. Manley that these results were not published owing to inaccuracy in the reading instruments employed.

The correspondence relating to our request for Prof. Langley's work will ? b e found in the miscellaneous communications in this Bulletin.

I feel that the designing of a propeller which would be most efficient for a certain machine is one of the things we know least about, and the propeller is certainly the most important adjunct to a successful machine. If the compilation of results referred to by Mr. Manley could be at our command before our experiments begin we might be saved much labor, such as going over work already performed by others. JA.D.McC.

4

TELEGRAMS FROM MEMBERS AND OTHERS .

March 18, Dexter (Halifax Herald) to Bell:— New York World wants your complete story on air flight. Review in detail of aerial achievement of past twenty years, and your forecast of what will likely be achieved long same lines in next twenty years. Can you write 5000 words and mail to me and when? Answer to-da t y . (Signed) F.P. Dexter.

March 18, Bell to Dexter (Halifax Herald) :— Telegram received. Too busy can't afford time. (Signed) Graham Bell.

March 18, McCurdy (Halifax Herald) to Bell :— Thanking you for past favors we would be very much obliged if you were to continue despatches on aerodrome tests. (Signed) W.R. McCurdy.

March 18, Bell to McCurdy (Halifax Herlad):— Mr. F.W. Baldwin, Chief Engineer of the Aerial Experiment Association made this evening, at dusk, a flight in drome No.4, McCurdy's Silver-Dart. This is the first time the drome has been tried by anyone except Mr. McCurdy. I can't undertake to do anything more than send my Associated Press Despatches which I presumed you received from New York. (Signed) Graham Bell.

March 18, McCurdy (Halifax Herald) to Bell :— We don't receive your associated press despatch from New York. If, in sending your Associated Press message you would also address it to Halifax Herald as joint message it would answer the purpose, or instruct the operator at Baddeck to send A.P. Despatch also to Halifax Herald, this would involve no extra labor on you. Canadian papers would then get your news for A.P. does not send news or ? i ginating in Canada back to Canada. By doing this you will greatly oblige. (Signed) W.R. McCurdy.

March 20, Bell to Curtiss :— Have your business arranged so as to be here 31st sure; very important and you will regret it all your life if not. (Signed) Graham Bell.

March 20, McCurdy to Curtiss :— Express four Dart wheels with tires. Don't forget oil. (Signed) McCurdy.

March 21, Curtiss to Bell: — Very satisfactory consolidation Saturday. Named Herring-Curtiss Co., Hammondsport. Interest and management retained. Gardiner here, home to-night. (Signed) G.H. Curtiss.

5

March 21, Bell to Thompson (Associated Press):— There is now open water on the Bras d'Or Lake excepting in sheltered Bays and it is expected that navigation will be resumed to-morrow. The Aerial Experiment Association, fearing that the good ice in Baddeck Bay may not last much longer, has decided to discontinue flights with the aerodromes Silver-Dart and Cygnet II for the present in order to secure some scientific data concerning the thrust of an advancing propeller, for experiments here indicate that the thrust of a rotating propeller when an aerodrome is flying in the air, is materially different from what it is when machine is at rest.

The Association has fitted up an engine and aerial propeller upon an ice-boat which makes a speed of about forty miles an hour under its own power. The power-driven ice-boat carries scientific apparatus for measuring the thrust of a propeller while advancing over the ice at various speeds. Upon the conclusion of the tests dromes 4 & 5 McCurdy's Silver-Dart, and Bell's Cygnet II will be tried again if the ice conditions on Baddeck Bay still continue good. (Signed) Graham Bell.

NB. The above telegram was also sent to Fred Cook, London Times Correspondent at Ottawa; to W.R. McCurdy, Halifax Herald; to Halifax Chronicle To Milton Brown, Sydney Post, and to the Sydney Record.

March 22, Cox to Thompson (Associated Press):— J.A.D. McCurdy, Secretary of the Aerial Experiment Association in drome No.4, McCurdy's Silver-Dart, made two successful flights on the ice in Baddeck Bay this morning. McCurdy's last flight brought much praise to the young aviator, as he circled the Bay three times in succession, covering a distance of about six miles in eight minutes. Mr. McCurdy in this flight dromed through the air at different elevations from six to thirty feet high, demonstrating his perfect control of the machine at all times.

Mr. F.W. Baldwin, Chief Engineer of the Association also made a flight in McCurdy's Silver-Dart to-day, but as the wind was pu g f fy at the time Mr. Baldwin shut off power and glided to the ice, the machine skidding to a great extent. A clock has been placed on the wheel of the Silver-Dart in order that the aviator might keep his own time. (Signed) Charles R. Cox.

6

Cox to Chas. S. Thompson (Associated Press).

March 23, Mr. J.A.D. McCurdy in Drome No.4, McCurdy's Silver-Dart made three flights from the ice in Baddeck Bay to-day. McCurdy in the last flight circled the Bay three times. A track had to be cleared on the ice to allow the machine to start as about 4 inches of snow had fallen during the night.

Mr. F.W. Baldwin, Chief Engineer of the Aerial Experiment Association also made a beautiful flight in the Silver ? - Dart to-day. (Signed) Charles R. Cox.

(The above was also sent to Fred Cooke (London Times Correspondent, Ottawa; Halifax Herald, Halifax Chronicle, and Sydney Record).

Fielding to Bell .

March 23, Will you give us the pleasure of your company at dinner on Satur a d ay evening twenty-seventh? (Signed) W.F. Fielding.

McCur ? d y to Bell .

March 23, Casey and I made several flights with Silver-Dart this morning during which the circular course was lapped. (Signed) Douglas McCurdy.

Gerald Brown to Bell .

March 23, Please advise me if possible time you expect to arrive Ottawa and name any who accompany you. (Signed) Gerald Brown.

Bell to McCurdy .

March 23, Congratulations. Received telegram Fielding and Brown. Stay Windsor Hotel Montreal. (Signed) Graham Bell.

McCurdy to Bell .

March 25, Silver-Dart tried out to-day. Substituted short ice runners for the hind wheels, but the wheels proved to be far superior. The ice was covered with about three inches of water which however did not interfere with the operation of the machine. Good luck to you in your address. (Signed) Douglas McCurdy.

7

EXPERIMENTS REPORTED BY THE EDITOR.

March 18, 1909: — Mr. Baldwin had the opportunity of trying the Silver-Dart this afternoon just about dusk. He did not make much of a flight but succeeded in getting into the air. I was not present but give below the accounts of Baldwin and McCurdy. A.G.B.

Baldwin's Account :— Took Dart out and ran her around in a snow storm. Didn't steer straight and nearly took the steering wheel off on a skid. Machine would not lift on elevating the front control.

Later in the afternoon after Conference John and I took the Dart out by ourselves and tried a short jump. The engine worked well and she went into the air with no difficulty. The starboard wheel lifted first. When in the air the machine turned to starboard for some reason, and fearing that skidding action was getting worse and not wanting to break the wheels I shut off power. F.W.B.

McCurdy's Account :— This afternoon we took the Dart out on ice with the intention of having Casey make a flight. He took his seat and the engine started. He sped away, but as his plan was to get just the feel of the machine and controls, he did not allow her to rise, but described a long circle to starboard coming back almost to his starting point.

Later on in the day about 5.40 P.M., after the Laboratory was closed we again took her out and started the engine. It worked well and Casey started off. She rose nicely but a turn to starboard evidently decided him to shut off which he did, 8 landing after traveling a distance of about 35 yards. The distance was easily paced off on the ice as a slight fall of snow showed exactly where the wheels left the ice and where they landed. It was very pretty to me as it was the first time I had seen the machine under way. J.A.D. McC.

March 20, 1909 :— This morning Baldwin had another try at the Silver-Dart. The following are the accounts given by McCurdy and Baldwin. A.G.B.

McCurdy's Account :— This morning Casey took out the Dart and tried for a flight. The ice was covered with about 4 inches of snow saturated more or less with moisture.

The engine worked well but sufficient speed to cause the machine to take the air could not be attained.

Just to see whether thirty pounds in weight would make the necessary difference in speed (Casey is thirty pounds heavier) I tried a run but with the same results.

We then had a track ploughed on the ice about half a mile long and Casey tried again. This time he succeeded in getting into the air, and a short flight resulted.

A minor repair was here necessary and so experiments were postponed till afternoon. J.A.D. McC.

Baldwin's Account :— John and I tried the Dart this morning with about six inches of snow covering the ice. I could not get the machine into the air. We then had a track cleared and I tried a short flight. It did not seem to me at first that she would carry me so after trying to raise the control slowly and failing to get up I gave her a quick shoot. This put her into the air all right; but after a short distance she 9 came down again to one side of the track so I did not get up again.

The beam which holds the front wheel was weakened, although landing was quite easy, so we decided to have a small iron reinforcement put over it before trying later. F.W.B.

March 22, 1909 :— As it will take some days to make repairs on the Gauldrie's engine, the proposed experiments with the ice-boat must be postponed. Mr. McCurdy and Mr. Baldwin took advantage of this delay by making some practice flights in the Silver-Dart. In one of these flights McCurdy circled Baddeck Bay three times without coming down droming for at least six miles in the air. I give below accounts of these experiments by Baldwin and McCurdy. A.G.B.

Baldwin;s Account :— John made two flights this morning round the Bay in the Silver-Dart. On the second flight he made three rounds of the Bay starting at Laboratory and circling around from the old church to about the warehouse and back to Laboratory. In this flight he was in the air for about eight minutes. Shifted yoke back and I took a small jump in the

Silver-Dart a little over 100 yards. A side gust caught the machine and she slewed around breaking back wheels and a chord in landing. F.W.B.

McCurdy's Account: — Silver-Dart made this morning several flights. First tried to circle in the Bay starting at the Laboratory over to the Crescent Grove Shore and round to the warehouse etc. etc.

The first trial was unsatisfactory as the machine touched the ice several times. We stopped the engine and put more 10 oil in the crank case and tried again. This time we succeeded in making three complete turns. Time in the air being eight minutes. The wind was blowing in puffs from the SE. and SW.

Casey had the tip lever shifted back about two inches and made a flight. A puff of wind however, struck him from off the port bow and tipped him up so that the starboard wing struck the ice and consequently the machine turned rapidly to starboard and the wheels gently removed from under the Dart. Repairs, however, can be made in about an hour or more. J.A.D. McC.

March 23, 1909 :—Experiments were continued with the Silver-Dart on the ice in Baddeck Bay to-day. I give below the accounts of Mr. Baldwin and Mr. McCurdy:— C.R.C.

McCurdy's Account: —The morning being exceptionally fine for flying the Dart was taken out on the ice about 9.30 A.M.

Mr. Manchester had ploughed a track through the 4 inches of heavy snow which extended in the direction of Baddeck for about # of a mile.

It is worthy of note that the engine has for the last two or three days worked beautifully, no tuning being necessary at all. It was agreed that I should try her first with the idea in view of circling the Bay as many times as possible. At the conclusion of experiments yesterday afternoon a watch had been attached to the center of the steering wheel so that the aviator could observe the time of flight for himself.

The Silver-Dart started off well and responded at once to the action of the front control. The yoke had been previously 11 shifted back 2 inches to accommodate Baldwin's weight and I soon found that the center of gravity, with my weight, was too far back. I therefore landed after making one complete circle and had the yoke shifted forward to its old position. This time the machine seemed to be better balanced but the power of the engine didn't hold out owing to over heating and so again after completing a circle during which I touched the ice twice, the power was shut off and investigation showed that the water in the jackets was very hot.

To prepare for the third experiment we put a quart of light oil directly into the crank case and waited about twenty minutes till the water was cool. The circulating system, pump, etc. were carefully looked over and tested to be sure that good circulation was ensured.

During the 3rd flight, the Dart covered the circle touching the ice but once. Investigation again showed the water was hot. The reason for this was not apparent.

The weather still continued good and so Baldwin was elected to make a try. Everything in connection with the engine and machine proper was carefully looked over, and at the signal Baldwin started. He only made a little jump of about 100–200 feet finally landing at the end of the ploughed track. Here the machine was turned round and off she started again going due East. The machine rose well to a height of about 6 feet and flew for about 6–700 feet when suddenly she rose to an altitude of about 12 feet and there dove striking the ice with the front wheel. Casey immediately stopped the engine and we all hurried to the scene. It proved 12 to be one of those accidents which seem to be a lot worse than they really are. The machine proper was not injured at all. The bow control and trussing gave way and a wheel was slightly bent. Repairs will be easily effected in a day or so. J.A.D. McC.

Mr. Baldwin's Account :— The ice was in very poor condition this morning for experiments but the morning was so still that we took Dart out for an airing.

The engine worked well and John made a very pretty circle of the Bay at an average height of about 10 ft. from the ice. After landing the yoke which controls the forward lateral rudders was shifted forward a few inches because McCurdy found the balance not as good as usual. When this change had been effected John made two more flights. The first of these was not ver u y satisfactorily owing to the overheating of the engine. We could not see why the engine should overheat and examined the water circulation but found everything O.K. There was plenty of oil in the crank case and the oil feed was working, and we are still in the dark as to reasons why the engine should have overheated. On other occasions the cylinders have remained perfectly cool under similar conditions. It does not seem likely that the timing mechanism had slipped so that the engine was running on a retarded spark which would cause overheating, or that the mild weather could account for it.

I then took the Dart for a run down the track and made a short flight, and then started back from other end of track coming up towards the Laboratory.

13

The machine got into the air very nicely and on turning slightly to the left to clear the land, the starboard wing tilted slowly up. This was the first opportunity I have had to consciously use the lateral rudders. Their action was perfectly smooth and the machine came back on an even keel very satisfactorily.

I was just beginning to think that I had a nice clear field ahead of me to the end of the Bay when I made a sudden and quite unin ? t entional landing by shifting the bow control too far up and then too far down. The truck and back wheels were quite extensively smashed but funnily enough the front wheel itself was not even bent. When the header at the front of the truck gave way the bow control scraped along the ice and was badly broken. F.W.B.

14

EXPERIMENTS WITH THE SILVER-DART, MARCH 26.

McCurdy's Account :— Repair work on the Silver-Dart was rushed right along as fast as possible and so by this afternoon at 5 o'clock she was again taken out on the ice for a trial. As we had run short of wheels it seemed as although a good opportunity had offered itself to test the efficiency of ice runners or skids as compared to wheels such as we have been using. Two runners were made about 3 ½ feet long and by sutiable tubing braces were attached to the truck in the same manner as when the wheels are used.

The steering gear was left unchanged, and a wheel as usual was in its place at the front end of the truck making the third point of suspension. As our new control was not finished we substituted the red cloth control of the Cygnet II so that no time would be lost in making a trial.

The ice was covered over with about 3 inches of water which, with the addition of a little snow, made fast travel impossible. We, however, ran the Dart round the ice without making any attempt to fly her. The runners seemed to be sluggish, not allowing the machine to “get away” fast as in the case when wheels are used all through.

While repairs were going on with the Dart the eight cylinder engine was thoroughly overhauled inside and out and all of the nuts and bolts carefully looked over. We have ordered a new supply of wheels from the Curtiss factory and when they arrive we do hope that the long flight which we all so much desire may be pulled off.

J.A.D. McC.

15

Baldwin's Account :— The Silver-Dart was in commission again to-day with runners in place of the back wheels. The runners were about 3 ft. 6 inches. They were made of wood with half round iron for a shoe and were so arranged that they fitted in taking the place of the back wheels without necessitating any change in the running gear.

The front wheel was left as before and the front control of the Cygnet II a u sed as the new one was not ready.

The ice was covered with three or four inches of slush and water which made the going very bad.

After turning the engine over inside the harbor the machine was pushed over the neck of land and headed out on to the Bay. It was evident from the difficulty we had in pulling the aerodrome along that it would be hard for her to pick up good speed when under power. However it looked like a good opportunity to see how runners worked over very bad ice.

When the engine was started the ice was so sticky that the Silver-Dart instead of having to be held back had to be given a little push to get started. She picked up headway very slowly but after going about 200 yards seemed to be making pretty good time. The front wheel and runners threw a great deal of spray all over the machine and John got thoroughly soaked before he had gone very far. Two short runs were made and the machine was taken back into the shed.

The experiment indicated that under the circumstances wheels would have offered much less resistance. A mud guard on the front wheel might make it much pleasanter for the 16 aviator. Although no turns were attempted Mr. McCurdy when interviewed after the experiment expressed himself as being of the opinion — dirigibility offered no insuperable difficulties. F.W. ? B .

17

HAS THE OMISSION OF THE TAIL IMPROVED MACHINES: By F.W. Baldwin .

The object of our experiments is, presumably, to develop an aerodrome of practical utility. If so, we should consider the pros and cons of a question which is of vital importance in the operation of our machines.

The laurels in the commercial field will be won by the machine which is most easily handled. High speed and efficiency are of secondary importance to air-worthiness in the present state of the art. There does not seem to be any doubt that a machine with a tail is more easily controlled, and the great argument against a tail is that it is unnecessary and incidentally impairs the efficiency of the aerodrome.

The “drag of the tail” has become a sort of a by-word suggesting inefficiency and obsolete design, but it is always well to consider results quantitatively. The tail on the “June Bug”, for instance, undoubtedly offered more resistance than the vertical rudder and its truss does on the Silver-Dart, but we should compute exactly how much the resistance of the machine has been reduced by the omission of the tail before finally discarding it.

One argument which is usually advanced against a tail is the increased resistance due to the draft of the propeller. This is of course true but we are apt to get an exaggerated idea of this increased resistance by observing the draft of a propeller when the machine is stationary. In flight the draft is increased only by the velocity of slip

18

The big question involved is longitudinal stability. It is a matter of choice whether we want a machine which is easily upset and easily righted or hard to upset and hard to right.

Mr. McCurdy seems to have no difficulty in maintaining smooth flight in the Silver-Dart unless the wind is puffy. With a puffy wind the machine pitches and scends in a quick uneasy fashion which suggests that the flights would be much steadier with a tail.

The difficulty with a very sensitive control is that the operator moves it too far. It may be that in a wind a quick, sensitive control is necessary. We have not had enough experience in really windy weather to appreciate just what the conditions are, but in comparatively still weather it would seem that the advantage lay with the machine in which the fore and aft motion was somewhat damped.

If the objection to the tail is the resistance it offers, the same effect can easily be obtained by putting the fixed tail in front, so to speak, and using the bow control truss to support it.

This i e?? dea , if carried to an extreme, would produce a machine of the Langley type and might be a step in the wrong direction. Still it is worth thinking about.

Mr. Lanchaster in comparing the Wright and Voisin machines aptly remarks of the Voisin type that “In the hands of a beginner the machine would, very li ? k ely, be able to take care of the aeronaut to some extent until the aeronaut has learned to take care of the machine”.

19

The truth of this remark is born out by experiment. Although many men have made flights in the Voisin machines (always, as far as we know, in public) the landings have been consistently good, and some very remarkably flights have lately been made by inexperienced aviators.

The Wrights' machine, on the other hand, has been completely wrecked by a sudden dive when they were experimenting at Kill Devil Hill tuning up their machine for the Government trials at Fort Meyer.

If it had not been for example of the Wright Brothers, I doubt very much if we would have discarded the tail, but however that may be we should see to it that we see clearly the advantage and have good and sufficient reason for adopting such an important modification in our machines. F.W.B.

20

<u>CURVED SURFACES FOR FRONT CONTROLS</u> : By J.A.D. McCurdy.

It seems to me that perhaps in the design of our front controls, we are confining ourselves too much to the elementary function of that control.

We assume that as the function of this part of the aerodrome is to control the elevation of the machine by say, first, presenting a positive angle to elevate and then a negative angle to depress we must necessarily arrange things so that the turning moment produced positively is equal to the turning moment produced negatively.

Under such an arrangement the bow control when producing no turning moment does not add to the support of the machine as a whole. It is even possible that it does not even support its own weight and that of its supporting truss.

Would it not be better that the front control be given a positive angle of incidence, the same as that given to the main planes, and that the surfaces composing this control be given the curved form similar to that designed as most efficient for the main surfaces.

Now what would happen when we wish the machine to descend, would be that simply the lift of the bow control would be diminished as we decreased its angle of incidence. The drift element resulting from such an action would probably be much less than if the surfaces were substantially flat. In causing the machine to rise a greater positive angle would increase the lift without materially increasing 21 the drift element.

Mr. Baldwin has suggested in an article written by him which appeared in Bulletin XXXIV pp 37–39 that the head resistance of controls would be greatly reduced by making them approximately square in plan instead of having comparatively great lateral extension. This is undoubtedly true from the standpoint of head resistance due to its struts, chords, and guy wires, but from an efficiency standpoint I think that the form we have already adopted, that is quite narrow from fore to aft, and having great lateral extension, would if its surfaces were curved and having its m n eutral position at say, 4 degrees, positive angle of incidence proved to be a o f better advantage to the machine. J.A.D McC.

22 23 24

LECTURE ON AVIATION AT BADDECK : By Charles R. Cox

On Tuesday evening March 23, nearly everyone crossed the ice from Beinn Bhreagh, in the midst of a blinding snow storm to listen to the Lecture on Aviation given by Mr. Douglas McCurdy, and Mr. Frederick W. Baldwin in aid of the Parent's Association of Baddeck.

Although the night was perhaps one of the worst we have had this winter, it did not materially interfere with the attendance, as the Court House was well filled, and was a great success from a financial standpoint.

Mr. H. Percy Blanchard, acting as Chairman, opened the meeting by stating “There is something in the Air”, which remark brought laughter and applause. He further went on to state, that the Association was sorry that they did not have the honor of listening to Dr. Bell, who had gone to Ottawa to make an address before the Canadian Club of that city, but that he would take great pleasure in introducing the first speaker of the evening, well known to all present, Mr. F.W. Baldwin, who sometime will be Sir Frederick Baldwin, otherwise known as K.C.B. It was some little time before the joke was actually taken up, but which finally brought forth much laughter and applause.

Mr. Baldwin in his address, which towards the end was illustrated with Lantern Slides took up the subject of Aviation from the time of Leonardo de Vinci (1492) up to the organization of the Aerial Experiment Association at Halifax, Nova Scotia, October 1, 1907. Mr. Baldwin with few 25 changes repeated his lecture which he delivered before the Faculty and Students at Toronto University, and the Canadian Club of Toronto. This lecture appeared in full in Bulletin XXXIII pp 8–29.

Mr. J.A.D. McCurdy then took the subject from the organization of the Aerial Experiment Association, Oct. 1, 1907 up to the present experiments, which have been witnessed daily by the people of Baddeck on the ice in Baddeck, Bay illustrating his lecture with lantern slides. Mr. McCurdy spoke as follows:—

Mr. Chairman, Ladies and Gentlemen:—During the Spring of 1907, Dr. Bell had gathered around him four young men who were more or less interested in the subject of Aviation. These men to whom I refer are personally known, I think, to you all, and are respectively, Messrs. F.W. Baldwin, G.H. Curtiss, the Late Thomas E. Selfridge, and myself. All through that memorable summer we had the oppo t r tunity, and I may say privilege, of being closely connected with Dr. Bell in his work.

One afternoon in September, after we had come home from the Laboratory and were sitting round the big fire in the Hall of Dr. Bell's home, Mrs. Bell presiding over the small tea table, announced that she had conceived an idea which had been appealing to her more and more as time went on, and now she intended to submit it to Mr. Bell before all of us who were present.

She briefly reviewed the work which led to the establishment of the Volta Association, which had been started 26 and financed by Mr. Bell many years ago, and which consisted of himself and three other gentlemen, the object of which had been to produce a talking instrument; and so the graphophone was evolved which to-day is of great scientific value and the source of great amusement to old and young.

She then went on to say, that here was a similar condition of affairs, Mr. Bell surrounded by these young men who were all interested, both in Mr. Bell personally, and the work for which he labored. Now the proposition was, that Mr. Bell should form an Association of some kind, the object of which would be “to get into the air”. Mrs. Bell herself generously proposed to finance such an Association.

It is perhaps hardly necessary for me to state, that the idea met with the enthusiastic approval of us all and so after considerable planning on the part of Dr. Bell papers of the organization of the proposed Association were drawn up and signed by the above named five gentlemen in Halifax.

October 1st, 1907, thus marks the date which will long be remembered by us personally, and perhaps also by those who have followed the development of the Art, the organization of the Aerial Experiment Association.

Work had been going on during the summer on the construction of a large man-carrying tetrahedral kite. This machine was designed and in fact most of the details worked out by Dr. Bell. The younger members of the Association with Mr. Bedwin had of course many suggestions on points of construction to offer. When completed the kite was indeed a 27 beautiful structure composed as it was of over 3000 small tetrahedral cells covered with brilliant red silk. The egg had but just hatched, and a beautiful young swan had been born. Such was the comparison made by Mr. Bell when Mrs. Bell by pouring over its ? b ow a mug of Beinn Bhreagh water christened it the Cygnet.

It was early in December when finally all preparations were made for the first trial of the Cygnet. The Victoria Steamship Company kindly supplied us with the services of their boat, the Blue Hill, with which to tow the floating raft “Ugly Duckling”, on which the Cygnet rested.

It had been decided that Lieut. Selfridge should have the honor to be the first to make an ascension in a tetrahedral structure, so on December 6, he took his place in the man-hole of the machine dressed in as light clothing as was compatible with the weather conditions.

When off Beinn Bhreagh Head the steamboat was headed into a NW wind and the signal given to the men on the deck of the Ugly Duckling to “let go”. Away soared the kite to an altitude of 168 feet. The wind, however, was of insufficient velocity to support the machine, and so during a period between two puffs the Cygnet gently came down till finally she rested on the surface of the water. So slowly and gently did she descend that Selfridge was not aware that he was coming down till suddenly he was rushed forward through the water at the speed of the Blue Hill. The smoke from the funnels had so obscured our view from the upper deck of the boat that the signal was not given to cut the flying line, 28 and so the beautiful structure was totally wrecked. Some data had, however, been secured by Selfridge from the scientific instruments which were secured to the Cygnet in places convenient for his observations, and the angle of flight and wind velocity were carefully noted by him in his book.

The season was by this time so far advanced that the Association decided to go to Hammondsport, the home of G.H. Curtiss. This town held special advantages as our work would be near the motor cycle shops of Mr. Curtiss. A large Lake was close beside us where experiments over the ice could be conducted, and a meadow of considerable size just outside the limits of the T ? o wn, where experiments could take place in the summer after the ice had gone.

We were all very anxious to build a glider, the technical meaning of the word has been so ably explained by Mr. Baldwin. This machine served its purpose, but as a stimulent to get into the air in a power machine, rather than in giving us any actually data from which we could design machines. We made about 50 glides in all, varying in length from 10 feet to 100 yards. Well do I remember the hard bumps which resulted from losing control of the glider when man and machine were thown violently to the ground.

We soon had collected together all the information we could obtain on the construction of machines which were actually flying, and by sorting out what we considered their good points incorporated them into ideas of our own, and so finally the first power machine of the Association was lying in the aerodrome shed at Hammondsport ready to be tried. At the suggestions of Mr. Bell and Mrs. Curtiss it 29 was officially named Selfridge's Red Wing. This machine was given its first trial over the ice on Lake Keuka on March 12, 1908.

Mr. F.W. Baldwin, who was the aviator therefore has the honor of being the first man to make a public flight in a heavier-than-air machine in America. The distance covered by the aerodrome was carefully measured by means of a steel tape, and the actual distance recorded was 318 feet 11 inches. We were all of course very much pleased and Mr. Bell jokingly remarked that it was fine, but only to think, that it was made by a Canadian and not by an American.

The Red Wing was tried once more on March 17, St. Patrick's Day, but the good Saint forgot to come to our aid, for a sudden puff of wind turned the machine up on end, so that the port wing struck the ice, and the Red Wing was telescoped into a shapeless mass on the ice. Baldwin however escaped without any injury whatever. The accident to this our first machine did not however dampen our spirit, and so at once designs were gotten out for our second machine, Baldwin's White Wing.

By this time the ice had all disappeared, so the runners were replaced by wheels. Mr. H. Champlin, a gentleman of Hammondsport kindly offered us the use of his large meadow at one end of which was a half mile race track. A strecth of this track we proposed using as a place for starting our machines. The machine proper differed from the Red Wing, in that moveable wing tips were provided being substantially a continuation of the main surfaces whereby the operator 30 could preserve the lateral balance of the machine. The White Wing made in all five flights, the distance of which ranged from 20 to 300 yards. In the final flight, in which I was the aviator the machine got away from me, and plunging to the earth was completely demolished. I however came through the fall without mishap.

We felt by this time that our successes were such as to warrant out building a third machine, and especially with the idea in view of applying for the award of the Scientific American Trophy, it was decided that Mr. Curtiss should alone ride the machine, which was finally named the June Bug. By adopting such a plan much experience could be gained by repeated flights, whereas if all took turns as aviators, disaster to the machine was sure to come.

Many successful flights were made of varying lengths and at last we thought that our chances of lifting the Scientific American Trophy were fairly good, and so arrangements were made with the Aero Club of America to come to Hammondsport on July 4, and officially observe our flight over the prescribed distance of one kilometer. This distance was easily negotiated, and so not only did we win the coveted trophy, but added to our records the honor that one of the Association aerodromes was the first to make an official flight in America.

For the remainder of the summer months the June Bug was flown day after day by Curtiss, Selfridge and myself, and much experience gained in control and balance. Her record flight was in covering the figure eight, a distance of about 2 ½ miles.

31

Still a fourth machine was built at Hammondsport which, I think, is perhaps known to you all, as the Silver-Dart. A specially designed water-cooled motor was installed in the machine, and we anticipated longer flights. A mile and a half with part of a turn negotiated was the greatest distance covered with the Silver-Dart at Hammondsport, and so with the first of January plans were completed for tansporting the machine to Baddeck, where experiments could be conducted over the ice on Bras d'Or Lake in conjunction with the tests to be performed with Drome No.5, Bell's Cygnet the Second.

This large tetrahedral structure as you are presumably aware resembles the Cygnet I in general appearance. It is composed of nearly 4000 small tetrahedral cells, and the completed structure is mounted on ice runners to facilitate getting up speed over the ice.

It was Dr. Bell's original intention to try this machine in a similar manner to that employed in flying Cygnet I, but navigation being closed on the Lake due to the formation of ice, compelled us to perform tests along the same lines as in the case of our other aerodromes. Several trials have been made, but so far the Cygnet has not left the ice. It is possible that this is due to improper application of the power at our command, or it may be that head resistance of the structure is too great when as in the case of Cygnet II pure tetrahedral construction is emplyed all through. I think that I may assume that you are all with us in hoping that we may in time succeed in getting 32 a tetrahedral structure into the air under its own motive power.

Numerous flights have been made with the Silver-Dart on Baddeck Bay, the first of which marks an epoch in the history of Canada, for on Feb. 23, 1909, at Baddeck the first flight in Canada of a heavier-than-air machine took place. As time goes on and Canada gains more and more proinence in the eyes of the aeronautical world, the citizens of Baddeck can look back and be proud that their home town was instrumental in introducing aviation into the Dominion.

On the 31st of this month the Aerial Experiment Association will be dissolved, but in name only, for we sincerely hope that circumstances will permit the members to work together in the future along lines which through the Aerial Experiment Association have proved to be so agreeable, interesting and instructive to us all. J.A.D. McC.

At the conclusion f o f the lecture a vote of thanks proposed by Mr. Sutherland and seconded by Mr. McIntosh was unanimously adopted, expressing the appreciation of the citizens of Baddeck for the opportunity of listening to the very instructive address concerning a work in which Baddeck along with the rest of the world was deeply interested. C.R.C.

33

LETTERS FROM MEMBERS AND OTHERS .

Bell to Walcott .

Baddeck, N.S., Feb. 16, 1909 :— In Langley's “Experiments on Aerodynamics” p.88, reference is made to a complete series of propeller experiments, the details of which “are reserved for future publication”.

The members of the Aerial Experiment Association would like to have access to this material, and will be much obliged if you could help us in the matter.

(Signed) Alexander Graham Bell.

Walcott to Bell .

Washington, D.C., Feb. 23, 1909 :— Referring to your letter of Feb.16, I beg to say, that the material you refer to giving the account of Mr. Langley's propeller experiments is now in the hands of Mr. Manley, who has in preparation the volume giving an account of Mr. Langley's work subsequent to his Memoir “Experiments in Aerodynamics”.

I have to-day written to Mr. Manley asking how soon the manuscript will be ready for the printer, and also whether the portion about which you enquire is available for reference.

(Signed) Charles D. Walcott.

Walcott to Bell .

Washington, D.C., March 17, 1909 :— I beg to enclose herewith a copy of a letter just received from Mr. Manley in regard to the series of propeller experiments about which you wrote me under date of Feb. 16, 1909.

(Signed) Charles D. Walcott.

34

Manley to Walcott .

New York, March 16, 1909 :— Continued absence from the City has delayed me in replying to your of Feb. 23. Regarding the Memoir I regret that it is not yet ready for the printer, but it is making steady progress and I am putting all the time I can possibly spare on it.

Regarding the data on propeller experiments referred to on p.88 “Experiments in Aerodynamics” most the data of the experiments which had been made at the time this note was published was later found to be incorrect owing to inaccuracy of the measuring instruments of the whirling table.

In the summer of 1898 I made a rather complete series of tests and this data is being embodied in the Memoir. Some of it, however, has not yet been calculated out, but I hope to finish the calculations on it some time within the next few weeks.

To compile the “raw” data into a form intelligible to anyone else would take nearly as long as to complete the calculations ready for the Memoir. So I think it hardly practicable to give the data to Dr. Bell until I have had a chance to complete preparation of it.

I can then easily supply Dr. Bell with a copy in advance of its publication.

(Signed) Charles M. Manley.

35

LETTERS FROM MEMBERS AND OTHERS .

Cook (London Times Correspondent) to Bell .

Ottawa, March 16, 1909 :— I have to renew my thanks for sending me the results of your experiments in aerial navigation. The Times has been endeavoring to arouse the British War Office from its lethargy on this important question, and as our new Chief, Lord Northcliffe, was at Pau watching Wilbur Wright's experiments your messages fitted in admirably with the telegrams which Lord Northcliffe was dictating from Pau. Thanks very much for the description of the Silver-Dart and Cygnet II. They were just what I wanted, and I shall have pleasure in using them in the Times. If you have no objections I should like to send the photographs to Lord Northcliffe.

I am only sorry that the fact of Parliament being in session prevents me from running down to Baddeck to witness your experiments. I am glad to know that the attention of the Home Authorities has been drawn to the work of your Association. Probably the result may be that the War Office will ask for an official report upon the subject.

(Signed) Fred Cook.

Government House Ottawa to Bell .

Ottawa, March 20, 1909: — His Excellency desires me to write and ask you if you would stay with him at Government House on Saturday next as he hears that you will be in Ottawa o m n that date.

(Signed) A.V. Fife, Capt. A.D.C.

36

Post to Bell .

March 19, 1909 :— It is with great regret that my opportunity to visit Baddeck and your Laboratory seems to have passed for the present, and I also regret that the rules would not allow the contestant making the best record to have his name inscribed on the Scientific American Cup at the time of making the test. It would seem to me that this stimulus would be necessary to give aviators something to strive for, while as it is, it would seem to produce the result of having all the machines held down to their very lowest distance until midnight, Dec. 31st, when all would have a race by moonlight to see which could fly the furthest before the new year. I wish to extend my most sincere and deepest congratulations to Mr. John McCurdy and Mr. Casey Baldwin, and wish I were flying with them.

My best wishes for your success with the Cygnet II.

(Signed) Augustus Post.

37

Bishop to Bell .

New York, March 23, 1909 :— It was with a great deal of regret that I received your telegram some days ago. I beg to assure you and I hope you will appreciate that the Aero Club of America has no desire to prevent the Aerial Experiment Association from having its name engraved on the Scientific American Trophy as many times as possible. It appears that you were under the impression that the rules promulgated last September still hold good, but those rules were announced for a definite date and as the trophy was not competed for on that date the conditions no longer held. Enclosed you will find copy of the circular for that competition, also proof copy of the rules for 1909, which were in course of preparation when you entered first into communication with us. We have given a great deal of time and thought to the elaboration of these rules, and we do not think it possible to have machines appear at a designated time and place for public competition.

We have decided to adopt methods of competition which have proven successful in Europe, notably in the case of the Michelin Trophy which Wilbur Wright won last year. It was far from our intention and desire to shut off the Aerial Experiment Association from anything, but we felt that the rapid development of Aviation made it necessary to increase the interest and give the Trophy to the machine which had done the best work during the calendar year. In that way interest will keep up to the end of the year and competition 38 will be keen up to the last available date. This is just what happened between Farman and Wright last year in France.

We beg to assure you that we regret there should have been any misunderstanding on your part or on ours, and it is a great disappointment to us that we cannot have the honor to engrave the name of the Aerial Experiment Association on the Trophy which it won for the first time last July.

We also regret extremely that you were not able to be with us at our banquet last Saturday evening. I assure you the affair was very successful, and you were greatly missed.

(Signed) Cortlandt T. Bishop, Pres. Aero Club of America.

39

THE SCIENTIFIC AMERICAN TROPHY .

The Scientific American Trophy for heavier-than-air flying machines was offered by the Scientific American for annual competition under the rules and regulations formulated and promulgated by the Aero Club of America in 1907.

The first trial for this cup was held at Hammondsport N.Y., on July 4, 1908, by the Aerial Experiment Association of Hammondsport, New York. On the second trial the “June Bug”, in charge of Glenn H. Curtiss as pilot, rose from the ground and flew from a designated point a distance of 5,090 feet, and was awarded the trophy, having fulfilled the requirements of the Contest Committee and performed in this aeroplane a flight of more than a kilometer, which was the minimum distance required under the rules adopted for 1908 by the Aero Club of America.

In accordance with the Deed of Gift, which provides that the conditions for each contest for this trophy shall be made progressive in their severity of test, in accordance with the progress of aerial navigation, the conditions to be fulfilled by the next person entitled to have his name placed on the Trophy shall be a flight of not less than twenty-five kilometers, including a return to the point of starting, and a descent or alighting at a point not more than 100 meters from the point at which the machine rose from the ground.

40

RULES GOVERNING COMPETITIONS FOR THE SCIENTIFIC AMERICAN TROPHY FOR 1909 .

(1) It is distinctly understood that the Trophy is to be property of the Club and not of the members thereof, except in the event that any one person shall win the trophy three times, in which case it is to become his personal property.

Should the Trophy be won by the representative of some foreign club affiliated with the Aero Club of America through membership in the International Aeronautic Federation, it shall be held in custody of such Club, but it shall be subject to competition under the same terms and conditions as if it were still held by the Aero Club of America.

Should a contest or trial under the Rules not be held within a year from the date on which a foreign competing machine shall have won the trophy, the foreign Aero Club having possession of the cup shall give up its custody of the same and shall return the cup to the Aero Club of America, in order that the competition or trial for that year may be held in the United States of America.

The conditions under which the competitive tests and trials shall be made, shall be determined by the Contest Committee of the Aero Club of America, and such conditions shall be made progressive in their severity of test, as far as possible, in order to foster and develop the progress of the art of aerial navigation.

41

(2) All heavier-than-air machines of any type whatever (aeroplanes, helicopters, ornithopters etc.) shall be entitled to compete for the trophy, but all machines carrying a balloon or gas-containing envelope for purposes of support are excluded from the competition.

(3) To compete for this prize each contestant must notify the Club of his intention to compete, by telegraph or by registered letter, addressed to the Club at its headquarters in New York, and must specify the days on which trials are to be held. He must also deposit the amount of the fare from New York to the place of trial and return. Sufficient time must

be allowed for the representative of the Club to reach the place where the contest is to be held, with an additional two days in which to make arrangements for the journey. If trials are to be made within twenty-five miles of New York City the Club will send a representative without expense to the contestant.

(4) The person or Committee having charge of the test or trial shall make careful measurements of the distance covered by the flight, and shall prepare a written report of the test or trial, which shall be delivered to the Contest Committee of the Aero Club of America, and in such report shall state fully whether in his opinion the machine can be handled with safety and, as far as possible, he shall determine the speed attained during the flight. He shall also take into consideration the question of stability and ease of control, and he shall state in his report weather and wind conditions.

42

(5) The flights will be made in as calm weather as possible, but the Contest Committee or its representative will at its discretion order the contest to begin at any time it sees fit, provided the velocity of the wind does not exceed twenty miles an hour. The machine may start by running on the ground or upon a track under its own power, for a distance not exceeding one hundred meters, but no special launching device will be permitted. There is no requirement as to the height above the ground at which the machine must fly, but it must demonstrate its ability to rise or descend and circle to the right and left at the will of the operator.

(6) Complete specifications of the competing machine, giving weight, supporting surface and power of engines, together with a description of the best trial of the machine, shall be forwarded to the Contest Committee at or before the time of making entry for the contest.

(7) The minimum distance which must be covered by the competing machines during 1 (909 shall be twenty-five kilometers, including the return to the point of starting and a descent or alighting at a point not more than 100 meters from the point at which the

machine rose from the ground. Under the rules promulgated for the year 1909, bonafide owners of machines may make application for a test or trial, as ab i ove provided for. No entrance fee shall be required from persons desiring to compete for the Scientific American Trophy.

43

(8) No trial or test for the year 1910 will be allowed until the rules governing the competition for that year have been promulgated.

(9) All tests and trials shall be under the official supervision and direction of the Aero Club of America, and all questions that may arise in regard to such contest or trial shall be decided by the Contest Committee of said Club, and its decision in all questions of dispute shall be final, and without right of appeal to a court of law or equity.

(10) The winner of the Scientifc American Trophy for 1909 shall be the entrant of the flying machine which, in accordance with the above rules, shall make during the year mentioned the longest and best flight in excess of the minimum performance specified in Paragraph 7. His name and record will be appropriately inscribed on the Trophy.

(11) In case the Contest Committee is unable to determine which machine ha d s made the best performance during the year 1909, it shall arrange that a competition between such machines be held, and the machine making the best performance in such test shall be awarded the Trophy for the year.

44

GENERAL RULES APPLYING TO ALL AVIATION CONTESTS AND RECORDS ESTABLISHED UNDER THE CONTROL OF THE AERO CLUB OF AMERICA.

Each contestant by the fact of his entry for cups or prizes of the Aero Club of America, agrees to accept a decision of the Club without appeal, and further pledges himself in advance not to carry the matter to the courts.

The Aero Club of America declines all responsibility for accidents which may happen to contestants or to their apparatus, and contestants agree to assume all claims for damages to third persons or their property.

These conditions are accepted by every entrant for a record race, or a prize and by the very fact of his entry the contestant agrees to these conditions without reserve.

All contests for prizes and records must take place between ten A.M. and sunset.

All contests for prizes under the control of the Aero Club of America must be supervised by a person or persons delegated with the power authority by the President of the Aero Club of America or, in default, thereof, by its Contest Committee.

Persons desiring to enter for prizes or to establish records must notify the Aero Club of America in writing in sufficient time to allow for the journey of its representative to the place designated for the trials. Twenty-four hours must be given in addition to the time required for the journey.

45

If the trials are to be made within twenty-five miles of the New York City Hall the Club will furnish a representative free of charge. If the distance is greater than twenty-five miles the representative of the Club will be entitled to his fare for the round trip, and in addition to expenses at the rate of four dollars per day for the time the person is absent from New York.

If the trials are to be held within twenty-five miles from the headquarters of a Club affiliated with the Aero Club of America arrangements will be made with the latter to delegate a representative with all powers of the Aero Club of America for the purpose of certifying to the trials or contests.

For the purpose of giving official sanction to records one or more persons may be delegated by the Aero Club of America to represent it, as depends on circumstances as decided by the Club, but the expenses of one representative must be paid by the contestant.

The rules for each particular prize will state the amount of the entrance fee to be paid by the contestants for that prize. The delegate of the Aero Club of America has full power to direct the trials or contests on the ground chosen for the contests.

The terms delegate, representative, committee etc., as used in these and other rules and regulations governing aviation contests and records established under the control of the Aero Club of America shall be held to indicate the person or persons delegated with the authority of the Club for this purpose. He shall represent the Contest Committee either 46 in special or general cases and shall be appointed by the President of the Aero Club of America, and in default thereof by its Contest Committee.

Entrants for the various prizes may name, if they so desire, several different days for their trials; in such cases the full entrance fee must be paid for each day.

47

THE OUTLOOK OF AVIATION : By F.W. Baldwin.

The English newspapers are making a great howl about England's backwardness in Aeronautics. A very opportune panic seems to be forcing the Government's hand to take steps to get up to date in aeronautical equipment.

The rumour that the War Department is negotiating with the Wrights has neither been confirmed nor denied, but it would seem altogether likely that they would avail themselves of the opportunity to acquire one of the Wright's machines. Very little has leaked out in regard to the experiments the British Aeronautical Corps are supposed to be carrying on secretly, but the Cody Machine, at Aldershot, does not seem to have inspired much confidence by its performances.

The Aeronautical Society of Great Britain announces that a splendid practicing ground is now available for aviators to make experiments upon.

Mr. Moore-Brabazon will probably be one of the first to use it. He has bought a Voisin machine which is practically a duplicate of Farman's with the exception of the motor. This is a large eight-cylinder water-cooled motor which developes 55 H.P. and weighs about 280 kg (610 lbs) according to figures given in the last number of “La Revue de L'Aviation.”

Mr. Moore-Brabazon has already given his aerodrome a trial which proved very satisfactory. On the first trial 48 the balance was not perfect but this was corrected by shifting the fuel tank and the next day Mr. Moore-Brabazon made three rounds of the parade ground at Issy in splendid style in spite of a wind of about 10 or 12 miles per hour.

The very encouraging performance of this machine which carries a powerful motor, in which weight seems to have been a secondary consideration, is of signal importance to the art of Aviation.

The March Number of “La Revue de l'Aviation” also describes a monoplane which is being built for M. Victor Tatin. The propeller is in front and has a large blade area, M. Tatin being a strong believer in large surface and comparatively slow rotation. The diameter is two meters forty centimeters, and the pitch two meters fifty centimeters. He proposes to drive this propeller between 500 and 600 rpm., with a 2-1 gear from a 50 H.P. seven cylinder water-cooled engine.

Taking the rpm. at 500 and the pitch 2 m 50 cms. (8 ft.) the pitch speed is about forty-seven miles per hour. This seems rather low for a machine which has only 23 sq. m supporting surface (less than 250 sq. ft.).

The French School seems to be devoting a great deal of attention to machines with very small surfaces. M. Louis Bleriot has succeeded in making a flight with his monoplane No.11 so arranged that the surface is only 16 sq. meters. (172 sq. ft). The machine, weighs 250 kilos. (550 lbs) which gives a flying weight of about 3.2 lbs. per sq. ft. It is remarkable that this machine should fly at less than 40 miles 49 an hour and it would seem to indicate that there may be something in the claim of those who prefer the monoplane in the matter of efficiency. Bleriot himself, however, does not seem to have any preference as the machine he is now building is a double surface machine very much like the Wrights with the exception of his propeller plant which is a single four-bladed propeller driven by a 100 H.P. Antoinette motor.

The influence of the Wright's machine upon French designers is also quite apparent in the biplane built by M. Guée which is illustrated in the La Revue. The skid arrangement on which M. Guée proposes to land looks very crude and, unless he has exceptionally good control of the machine, some trifling repairs may be expected to interfere with his experiments.

The aeroplane Antoinette has apparently made some good flights but the particulars of them do not seem to be noted.

It is reported that the Wright Brothers are charging admission to the grounds over which they make their flights.

Miss Wright accompanied her brother for the first time on the 15th. She was up for seven minutes. Wilbur Wright has made two efforts to break the speed record for a kilometer. His best time was 55 seconds with the wind, 63 seconds against.

Orville Wright is superintending the building of a new machine which is being designed for speed.

50

Wilbur Wright now describes his present apparatus as “a slow old thing, suitable only for teaching”. During the month he definitely denied two rumours. First, that he was not thinking of discarding the starting rail, next he had no intention of entering for the Monaco Contest. On the 24th Orville got into the air for the first time since his accident. With his sister he went up in the balloon Icarus with the Marquis de Kergarion.

On Feb. 20 the monoplane R.E.P. piloted by M. Guffoy came to grief. At the close of a flight of 400 meters M. Guffoy drove into a bank on descending. The machine turned over and a blade of the propeller was knocked off. M. Guffroy was not hurt, however, and thoroughly enjoyed his flight. The speed was 80 kilometers per hour.

In a German publication Mr. Carl Dienstbach has an article on the Silver-Dart and, judging from the Illustrations, he appears to have a thorough grasp of the good points of the machine.

Count von Zeppelin has made a new record with his big airship. He ascended 3000 feet, the greatest height ever obtained by a dirigible balloon. After manoeuvring at this altitude he brought his machine down very gently over the land and found his boat arrangement quite as satisfactory for alighting on the land as on the water.

We read with great regret that Prince Henry of Prussia after being given a splendid ride in Zeppelin's machine was unkind enough to say that the dirigible balloon was still very imperfect and practically useless as an instrument 51 of war.

Herr Zipfel is making good progress at Berlin with a Voisin machine. On the 8th of this month he made a flight of 600 meters in what was considered quite a violent wind, but on the 16th, when venturing out again in a stormy breeze his machine was blown over and its left wing was damaged. Preparations are under way for a great International Exhibition at Frankfort to remain open through the summer.

It is said on good authority that no fewer than forty airships are to be built for the Italian War Department during the next twelve months. A sufficient sum has already been appropriated and six of the dirigibles will shortly be delivered. As many of them as possible are to take part in the military manoeuvres this summer.

The Aero Club of St. Petersburg already numbers no fewer than 800 members. The Government is reported to have ordered ten Wright machines.

An Austrian syndicate has purchased Henri Farman's old Voisin. They bought it because they were so anxious to have one at once that they could not wait for one to be built, moreover they wanted to have no doubt that their machine would fly. M. Legagneux, the head of the syndicate, spent most of the month at Chalons taking lessons. He made a brilliant start flying over two kilometers at his first attempt and then going on and doing five kilometers.

The final papers of the Herring-Curtiss Syndicate have been signed and it is understood that new concern will take 52 charge of the Curtiss' works immediately.

The machine which Mr. Curtiss will deliver and exhibit before the Aeronautic Society in May is described in “Aeronautics” as having a spread of twenty feet with a depth of four feet. The supporting surfaces will be parallel and spaced five feet apart. The vertical rudder will be placed in the rear and there will be a horizontal rudder both in front and rear. A new and partly automatic device for maintaining equilibrium will be employed consisting of moveable surfaces between the supporting frame. The surfaces will be made of the same rubber silk which is used on the Silver-Dart.

An automobile steering wheel will be used on which is located a spark advance and throttle. By pushing back and forth the wheel raises or lowers the horizontal control.

The engine will be a 25 H.P. four-cylinder motor driving direct at 6 ft. laminated wood propeller of new design, pitch equal diameter, at 1200 revolutions per minute. The engine has double valves in the head with a single push valve.

Another machine, which has already been built, is described in this month's aeronautics. Mr. Wilbur R. Kimball has turned out a remarkable looking aerodrome. The chief feature, apart from its struts and cross-struts is a weird propeller plant. Mr. Kimball proposes to drive his machine with eight four-bladed propellers the design of which is the result of many years of experiment and scientific research. They are 3 ft. 10 inches in diameter with a pitch equal to 4 ft 53 These propellers are placed in a row between the main surfaces extending the entire length of the machine. Transmission is effected by means of a small steel endless cable specially designed for the purpose. The motor is a 4 cylinder two-cycle 4 inch bore and 4 inch stroke, water-cooled and is supposed to develop 41 H.P. with a total weight, including magneto of 130 lbs.

The main supporting surfaces are parallel and measure 37 ft. in width by 6 ft. 6 inches depth and 4 ft 2 inches apart. The curvature of the surfaces are very shallow being about 1 in 26.

The front horizontal rudder is an open cell of two planes measuring 12 ft. by 2 ft. 6 inches, set 3 ft. apart placed 9 ft. 9 inches in front of the main planes.

One of the new and original features to which attention is especially directed is the unique lateral stability device. This is a very commendable copy of the lateral balancing rudders employed upon the June Bug and Silver-Dart.

The machine department of the Easton Cordage Co. of Easton, Pa. is building an aeroplane of the biplane type under the direction and supervision of Mr. C. Norvin Rinek which although it closely resembles in general appearance the Voisin type of machine differs very materially from it in detail and method of construction.

The machine is composed of one principal cell 10 meters in width and 2 in length. At the back is a smaller cell 3 meters in width and 2 in length, which is connected 54 to the main structure by means of steel tubing. The body or car of the machine is placed in the middle of the front plane and is joined to same by means of substantial aluminum casting, which in turn rests upon the chassis or running gear. With the exception of the car, the machine is built entirely of steel tubing and weighs complete, without the motor about 700 lbs.

The wings of the aeroplane are covered with rubber silk cloth. In addition to the main planes small immoveable planes or tips are attached to the ends of the main planes and so connected with the vertical rudder that they can be operated either s pe ep arately or in connection with it.

The power plant, situated in the rear of the car, consists of a four cycle water-cooled engine capable of delivering 60 B.H.P. at normal speed of 1200 rpm.

The propeller is a combination of steel and aluminum sheeting and probably is very similar to that used by Farman.

The March number of Aeronautics contains an article entitled “The Orville Wright Disaster” which gives Mr. Clime's version of the accident, and Dr. Bell's discussion of the lessons which may be drawn from what may have happened to the machine“. F.W.B.

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXXIX Issued MONDAY April 12 190 8 9

WITH APPENDIX A.

ASSOCIATION'S COPY

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell Assistant Editor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO. XXXIX ISSUED MONDAY April 12, 1909

WITH APPENDIX A.

Beinn Bhreagh, Near Baddeck, Nova Scotia .

TABLE OF CONTENTS .

APPENDICES.

Appendix A. The Secretary's minutes of formal meetings of the Aerial Experiment Association from the date of its organization Oct. 1, 1907, to the date of its dissolution March 31, 1909 (36 pages). This Appendix will be found at the end of this Bulletin after page 30.

Appendix B. Souvenir Volume of enlarged photographs illustrating the work of the Aerial Experiment Association (31 pages). This appears as a separate volume accompanying this Bulletin.

Appendix C. Portfolio of blue prints consisting of Engineer's working plans showing the construction of

The Kite Cygnet I

Drome No.1, Selfridge's Red Wing.

Drome No.2, Baldwin's White Wing.

Drome No.3, Curtiss' June Bug or Loon.

Drome No.4, McCurdy's Silver-Dart.

Drome No.5, Bell's Cygnet II.

This portfolio does not accompany the present Bulletin but will be forwarded by express.

1

EDITORIAL NOTES AND COMMENTS .

Dissolution of the A.E.A .

April 5, 1909: — The Aerial Experiment Association came to an end by time limitation at midnight on the 31st of March 1909.

It was quite a pathetic little group that gathered round the great fireplace in the Hall at Beinn Bhreagh, and watched the clock go round. Only three members were present, Messrs. Bell, McCurdy and Baldwin; with Mrs. Baldwin, Miss Mabel B. McCurdy, and Mr. Charles R. Cox present by invitation.

The vote to adjourn sine die was hardly put when the first stroke of midnight was heard, and. . . . . exeunt omnes!

And yet not all — the Trustee remains.

The Trustee of the A.E.A .

Mr. Charles J. Bell, Trustee of the A.E.A., is now the sole representative of the Association, the one remaining link to connect its part with whatever future may be in store for it.

Everything belonging to the Association now passes into his hands as its representative:—

1. There are the tools, and apparatus belonging to the Association.

2. The sum of $4000.00, being the last contribution from Mrs. Bell for the support of the Association; and

2

3. A small balance in the bank of $151.99 which has been turned over to the Trustee by the Treasurer.

Against these assets there are debts and liabilities to the amount of about $7000.00, not including the expenses incurred in issuing the Bulletins (about $1500.00) which have been met by me personally, and will not be charged to the Association.

The funds in the hands of the Trustee are not sufficient to meet these liabilities; and the Association has therefore authorized the sale of its tools and apparatus to me for whatever amount may be necessary to complete the payment (between two and three thousand dollars).

This plan provides for the extinction of the debts of the Association, and leaves me in possession of the tools and apparatus.

Any tools and apparatus at Hammondsport, N.Y., including the aerodrome “June Bug”, or “Loon”, will be presented by me to Mr. Curtiss.

The tools and apparatus at Beinn Bhreagh, including the aerodrome “Silver-Dart”, the aerodrome “Cygnet II” and the hydroplane boat “Query” will belong to me; and the “Silver-Dart” will be placed at the disposal of Messrs. McCurdy and Baldwin for practice purposes.

After the payment of the debts of the Association nothing will remain in the hands of the Trustee excepting:—

4. The inventions made by the members of the Association between Oct. 1, 1907, and March 31, 1909.

3

These may, or may not, turn out to be of value. In order to test the matter two applications for U.S. Patents have been prepared upon the Hammondsport work of the Association.

One of these, an application in the name of Mr. F. W. Baldwin, has been filed in the Patent Office, and bears the serial number 485,281.

The other is a joint application in the names of Alexander Graham Bell, J.A. Douglas McCurdy, F.W. Baldwin, G.H. Curtiss, and Thomas E. Selfridge. It has been signed by Messrs. Bell, McCurdy, Baldwin, and Curtiss; and will be filed in the Patent Office as soon as the signature of the Administrator of the estate of the late Thomas E. Selfridge can be obtained.

The Aerial Experiment Association had no funds that could be applied to the taking out of patents. The expense of such applications should of course be borne by any company or commercial organization formed to exploit them. No such organization at present exists; and I have therefore assumed personally the burden of expense of applying for these two patents, on the understanding that the commercial organization taking over the patents will return the costs.

These two patents, if allowed by the Patent Office, will be issued assigned to Mr. Charles J. Bell, as Trustee of the Aerial Experiment Association; and will be by him assigned to some commercial organization for stock or cash, and the proceeds divided in accordance with the agreement of organization of the A.E.A., and resolutions of the 4 Association relating to the disposition of the proceeds.

When a commercial organization acquires from the Trustee the rights to the inventions of the Association, it will then be the duty of this commercial organization to examine into the nature of the inventions, and decide which of them should be patented, and where.

Such a company would bear the cost of obtaining patents in the United States and other countries, and of defending them; and it would be the duty of the members of the Aerial Experiment Association to aid the company in obtaining patents by signing the requisite legal papers.

The Trustee should make arrangements with this company whereby a limit of time should be set for the preparation of patents. The Association expired on March 31, 1909; and I would suggest that all the inventions of the Association, or of its members, for which the company has not seen fit to apply for patents before March 31, 1911 should then revert to the individual inventors, and not be subject to claim by the company. This gives a period of two years within which to apply for patents.

At the present moment no patents exist to represent the work of the Association. There is nothing therefore to prevent anyone from manufacturing the inventions of the Association. It will not be until patents are obtained that the rights of the Association can be legally enforced; and a patent cannot legally be obtained for an invention which has been in commercial use for more than two years.

5

Should therefore persons not members of the Association manufacture aerodromes embodying the inventions of the Association we would have no remedy until our patents come out; and such persons would be under no obligation to recognize the rights of the Association until controlling patents had been obtained.

If however, individual members of the Association should enter into the work of manufacturing and selling aerodromes embodying the inventions of the Association before the issuance of letters patent upon them, they would be under a moral obligation to recognize the rights of the Association until a sufficient length of time has elapsed to enable a commercial organization to obtain patents upon the work of the Association. I would suggest, as a reasonable time, a period of two years from the 31st of March, 1909.

That is:— Should individual members of the Association go into the practical work of manufacturing and selling aerodromes embodying the inventions of the Association, and especially embodying those features claimed in our two pending applications for U.S. Patents, they should make some arrangement with Mr. Charles J. Bell, Trustee of the Aerial Experiment Association, or with the commercial organization acquiring from him the rights to the inventions of the Association, whereby they should recognize the equitable rights of the Association in the premises, by paying to him, or to the commercial organization succeeding him as owner of the inventions, an agreed upon royalty for each aerodrome sold. I would suggest that this arrangement should last until March 31, 1911; after which any 6 patents that may have been granted upon our work will protect the rights of the Association in the matter.

Of course such an arrangement would have to be made by the voluntary action of those members of the Association who enter into the commercial field, through a feeling of moral obligation to the Association of which they had been members.

The Proposed Joint Stock Company .

The Trustee of the Aerial Experiment Association has the power and authority to dispose of the inventions of the Association as he thinks best in the interests of the members; but various plans have been discussed in the Bulletins of the A.E.A. regarding what should be done upon entering the commercial field (see Bulletins XXXIV pp 3–13, XXXVI pp. 44–46).

The simplest mode of procedure seems to be to organize a special joint stock company to replace the Association; and I have suggested that it should be known as “The American Aerodrome Company”.

Let then a company be organized to take over the inventions of the Aerial Experiment Association with a nominal capital of one hundred thousand dollars; and let the Trustee sell the inventions of the Association to this company for the sum of one hundred thousand dollars in fully paid up shares of the company.

The Trustee would then divide the shares as provided for in the resolutions of the Association and in its agreement 7 of organization as follows:— To Mrs. Bell 35 per cent (for the $35,000.00 she has contributed to the support of the Association), and to Messrs. Bell, McCurdy, Baldwin, Curtiss, and Selfridge, 13 per cent each.

This would result in the following distribution of the shares:—

Mrs. Bell $35,000.00

Mr. Bell 13,000.00

Mr. McCurdy 13,000.00

Mr. Baldwin 13,000.00

Mr. Curtiss 13,000.00

Mr. Selfridge 13,000.00

$100,000.00

The above persons would constitute the first shareholders. Then, upon the first meeting of the shareholders I would propose that sixty-five thousand dollars of these shares should be turned into the Treasury of the company to be sold from time to time for cash as might be required. Of this amount, 35 per cent would be contributed by Mrs. Bell and 13 per cent by each of the other shareholders.

When Treasury stock is sold for cash it should be offered first to the actual shareholders in the proportion of their several holdings.

I would further suggest that the principal objects of the company should be:—

1. To obtain patents for the inventions of the Aerial Experiment Association in the United States and other countries.

2. To defend them.

3. To license individuals or commercial to manufacture aerodromes under the patents owned by company organizations

8

These are of course mere suggestions for the consideration of the Trustee, and the members of the defunct Association. The Trustee has full power to act as he thinks best in the interests of the members; and he knows more about business matters, and the organization of companies than I do. We are safe to leave our interests in his hands.

The Final Bulletin .

In issuing this, the last Bulletin of the A.E.A., I have thought it well to present to the members a copy of the Secretary's minutes of the formal meetings of the Association from Oct. 1, 1907, the date of its organization, to March 31, 1909, the date of its dissolution. This forms an appendix to this Bulletin.

I also present as a separate appendix a Souvenir Volume of enlarged photographs illustrating the work of the Association; with a frontispiece photograph of Mrs. Bell — “The Little Mother of us All” as Baldwin expresses it.

Another appendix will be forwarded to the members later on consisting of a large portfolio containing blue prints of Engineer's working drawings illustrating the construction of the kite “Cygnet I”, and of Dromes 1,2,3,4 and 5.

Conclusion .

The Aerial Experiment Association is now a thing of the past.

It has made its mark upon the history of Aviation 9 and <u>its work will live</u> .

Every success to the commercial organization that will succeed it, and to the individual members of the Association in their future careers, is the earnest wish of

Your Editor, Alexander Graham Bell.

10

EXPERIMENTS REPORTED BY THE SECRETARY .

Experiments with the Silver-Dart .

March 27, 1909 (Saturday):— The ice being in better shape than on the previous trial day the Dart, fitted with two runners in place of the back wheels, was taken out on the ice.

We were very anxious to see how the runners compared with the wheels from the standpoint of efficiency. Another change was made which I forgot to mention in the account of experiments for last day. This was in reference to the angle of incidence of the surfaces. In repairing the Silver-Dart, after Casey's accident, advantage was taken of the occasion to change the angle of attack from 6 to 4°.

To-day, as the Silver-Dart started, mist was falling quite heavily and in addition to this there was about two inches of water all over the ice. The Dart, however, responded to her front control after having traveled an astonishingly short distance, about 100 feet I should judge. The usual turn to port was easily made and a second one attempted during the same flight; the machine however, touched the ice after al?ost completing the second circle. The trouble was with the motor again although investigation failed y t o show anything which would give rise to this reduction of power.

A series of three such flights was made at the conclusion of which the machine was taken to the shed.

J.A.D. McC.

11

2 March 29, 1909, (Monday) :— This afternoon, although the ice was in a much worse condition than on Saturday, the Dart was given its usual series of trials.

We had with us on this occasion a gentlemen from Halifax of German birth, Mr. Hermann Drechsel, who is much interested in the subject of aviation generally.

Three flights resulted. In the last one of which the complete circle was made without mishap.

During this flight, which was about 3 ½ miles in length the Silver-Dart rose to a higher altitude than ever before attained with this machine. I should say the maximum height attained was about 50 feet.

J.A.D. McC.

12

DR. A. GRAHAM BELL'S ADDRESS BEFORE THE CANADIAN CLUB OF OF OTTAWA, MARCH 27, 1909 .

(Copied From “The Citizen” Ottawa, Canada, Monday, March 29, 1909).

CANADA MAY ENTER FIELD OF AERIAL EXPERIMENT. SUCCESSFUL YOUNG AERODROME EXPERTS GIVE DOMINION FIRST CALL ON THEIR SERVICES. PROF. A.G. BELL ADDRESSES CANADIAN CLUB. DISTINGUISHED AUDIENCE PRESENT.

SKETCHES HISTORY OF AERONAUTICS. WHAT BADDECK TRIALS HAVE DONE FOR CANADA. ZEPPELIN DIRIGIBLE MAY REVOLUTIONIZE WARFARE.

An address that was practical, intensely interesting and entertaining was given before the Canadian Club on Saturday by Professor Alexander Graham Bell, the guest of the day. The luncheon as usual was held in the Grand Union and the fame of the distinguished visitor resulted in the event being one of the most successful in the Club's history. The large dining room was filled to capacity and the smaller room had to be used. The President, Mr. Gordon C. Edwards, was in the chair and the guests included His Excellency Earl Grey, Hon. W.S. Fielding, Hon. William Paterson, Hon. George E. Foster, Sir Frederick Borden, Hon. Sidney Fisher, Hon. John G. foster, Mr. R.L. Borden, Dr. James Mills, Judge Idington, Sir Sanford Fleming, Sir James Grant, Capt. F.C.T. O'Hara, and many others prominent in the political, scientific and business world. The address by Prof. Bell was an admirable one. It was not technical and, while it contained a wealth of practical and new information, it 13 2 was not too heavy for the layman and was worded in a way which appealed to all.

Prof. Graham Bell is a man of striking appearance, learned but not austere, and he tells a story in the most pleasant way. His address dealt first with the telephone and then with airships. He traced the course of the inventions and pointed out that the control of the air, as far as a nation was concerned, was as important for to-morrow as the control of the sea is to-day. Incidentally he strongly urged that the Canadian Government should take some steps to secure for the nation the services of the two brilliant young Canadians who have been working with him for the last two years and who are now branching out for themselves with their inventions for aviation.

Prof. Bell was given a most enthusiastic ovation when he was introduced by Mr. Edwards. In responding Prof. Bell said:

“I thank you most sincerely for the cordial welcome you have given me. I do not know but that I have a little Canadian feeling in me too. I am a good American Citizen and have been for thirty-five years, but my heart has still a warm spot for Scotland, my native land, and for Canada, the home of my early manhood.

Invented in Canada .

It is a rather curious thing to me to see the dispute about where the telephone was invented. I have not any doubt about it. It was I who invented the telephone, and it was invented wherever I happened to be at the time. It so 14 3 happened that I resided in Salem, Mass., and carried on work in Boston, and then I would come up to my father's home in Canada to spend a large portion of my time. I carried my instruments with me, but of this you may be sure, the telephone was invented in Canada. (Loud Applause). It was made in the United States. (Laughter and Applause). The first transmission of a human voice over a telegraph wire, where the speaker and listener were miles apart was in Canada. (Applause). But the transmission was only one way — you could not talk back; you had to telegraph back. The first transmission by wire in which conversation was carried on reciprocally over the same line was in the United States, but I was there all the time, and it certainly is the case that the telephone was invented in Canada and the first actual use of telephone lines was in this country. (Applause). It is an interesting fact to me to look back upon those old days. It seems like a dream to me now; I can hardly realize that I had any connection with those events. But I can remember very well the way in which people used to look at me (the speaker tapped his forehead and sympathetically shook his head, causing great laughter and applause) just as they looked at me two or three years ago when I talked of a flying machine. The world has long since learned to know the reality of the telephone. And this great audience to-day shows that, thanks to the Wright Bros. and foreign inventors, and to your own Douglas McCurdy, you know that the flying machine has passed the experimental stage and is to-day in Canada.

15

4 The Airship .

I shall speak but little of the events of the past, except so far as they have to do with the Aerial Experiment Association which was organized in Halifax on 1st October, 1907, and has already produced four aerodromes or flying machines that have successfully flown, has a fifth completed, which is fluttering its wings but has not yet got into the air and a sixth partially done.

England was greatly in the front in the first scientific experiments relating to aeronautics. In 1670, there had been produced a very remarkable scheme that gave rise, by the bye, to our modern expression “Aerial Navigation”. It was the theoretical conception of De Lana who had lived a hundred years before the introduction of the idea of the balloon. He proposed to make huge copper vessels, 24 feet in diameter, and exhaust the air in them, when he thought they would rise.

Long before this time, 1670, attempts were made to fly. The experimenters always had one object in view, it was not the balloon, people had not come to that; the idea was one to which we have come back again, that we should imitate the birds, that the bird should be our model. So, men put on wings and jumped from high places and glided two or three hundred feet, and often fell down and broke their limbs or lost their lives, any number of them; several hundred did that before balloons were invented.

16

5 Aerial Navigation .

When Father De Lana came along with his proposition of these floating balls, the idea was really aerial navigation, that was the theoretical position. People supposed that the air had a surface like the sea, and, as a light body thrown upon the surface of the sea would float, the idea of the early experiments was that if they could get a body lighter than air, such as a hollow sphere from which the air had been exhausted, it would rise and float on the surface. But, of course, if men got above the surface they could not breathe; they must be below the surface. So, they got the idea of a ship hung below the floating body. The idea was reached of masts rising above the floating body bearing sails so that the ship could be propelled by the ethereal winds. It was a pretty idea. Of course, we know that it was entirely impracticable. But you can see that that is what gave rise to the term “Aerial Navigation”, which term has persisted to our day.

The idea was not realized for a hundred years afterwards when the Brothers Montgolfier, through a mistake invented a balloon. The Montgolfiers were papermakers. They were not scientific men, but they had the idea, common in that day, that the clouds were floating on the surface of the air. They thought that if they could manage to make a large paper bag and get a cloud in it, it would float. But the difficulty was to get the cloud into the paper bag. They observed the dense smoke smoke coming from the chimney, 17 6 went a little way into the air and became a cloud. Could they fill a paper bag with dense smoke? They tried to find the mixture that would make the densest possible cloud of smoke. They decided upon a mixture of chopped straw and wool. It made a frightful sme e l l. They got a great paper bag made and held it upside down over a bonfire of this material. To their great delight it floated to the top of the room. This proved that the principle was right. So they made a big one and tried it outdoors. But, instead of using paper they used cloth. It went up, and came down in a neighboring field.

First Balloons.

Then they made a much larger one and called the world to witness the first flight of a balloon. This was in 1783. It must have been an exciting day when the first living passengers were sent up. They were, I think, a sheep a cock and a duck, and, when they came down safely, the next question was to carry a man. Two men were sent up in a captive balloon and came down safely, and then they made the first real flight.

All this time, while the Montgolfiers were experimenting, scientific men knew that the new gas, discovered by Priestly, hydrogen, was lighter than air, and, by popular subscription the Brothers, Charles and Robert constructed the first hydrogen balloon. That was sent up without a man and flew well. The first hydrogen balloon was a great sight. It was found necessary to have soldiers 18 7 to protect it. It was brought through the streets of Paris at night, as a captive balloon, with troops in attendance. It was taken into the Champs de Mars where they could protect it from the crowd. It made a great ascent without a man aboard and disappeared in the clouds. It came down, perhaps twenty kilometers from Paris. Some country people who had never heard of such a thing, saw this great animal as they supposed it to be, come down from the sky. It was evidently alive — there was a little wind stirring, and the balloon moved from side to side. And it had a tremendous smell about it. Many villagers came with pitchforks and other weapons. They saw that this was a living creature, for it rolled from side to side as if in agony, and they did not dare to approach it. One man had a gun. Rather fortunately, he did not go too close when he fired. He hid behind a tree and shot the monster. Immediately there was a hissing sound and an awful smell. 'It is dying!'. 'You have wounded it!' they cried. When they attacked it with their weapons, they found that it was only skin. To make sure it was dead,they tied it to a horse and dragged it about a mile or two and then cut it up, and that was the end of the first hydrogen balloon. (Laughter and loud applause).

The Dirigible Balloon .

We all know that, from that time and for many years, the hopes of mankind in relation to aerial locomotion were based on the balloon, and the earlier experiments of the 19 8 men who had tried to imitate the bird were neglected and many of them forgotten. We are to-day performing experiments that were made before the introduction of the balloon. For a hundred years the balloon led men away from what I believe to be the proper line of investigation. It is only within recent years that the balloon, which is necessarily lighter than air, and therefore necessarily at the mercy of the air, was made dirigible. We have dirigible balloons, they have their great function, carrying heavy weights into the air. The balloon of Zeppelin carried up something like twenty men the other day and could make a speed of over thirty miles an hour and go a mile high.

Important to Empire .

Dirigible balloons have features that should make us pause. It is a thought, it seems to me, for the British Nation, supreme upon the waters, to consider that a balloon such as that of Zeppelin could float over London and all the British fleet could not prevent it. Of course, we do not know what Great Britain is doing. But the success of such machines as that means more to Great Britain than to any other power, because when these machines are used for the purposes of war sea power becomes secondary to air power. The Nation that controls the air will be the foremost nation of the world; so, the success of the dirigible balloon, even though to my belief, it is on a wrong basis, being lighter than air, is of the greatest importance to mankind. (Applause).

20

9 The Aerodrome .

Now, I wish to say a word with regard to the modern machines that we call aerodromes. People generally speak of these as aeroplanes. But they are not aeroplanes, for they have not a flat surface. Our aerodromes in Canada are curved in a particular way, and there is not an aeroplane in the whole machine. So, I hold the word “aeroplane” to be a misnomer as applied to these machines. I prefer the name suggested by Prof. Langley, the Secretary of the Smithsonian Institute, ‘aerodrome’. It comes from a well known Greek word which can be found in any dictionary of that language, and which covers the idea of traversing the air. An aerodrome is a machine that traverses the air and is much better than an aeroplane. The first machine of this kind originated in England. It was invented by Henson in 1842. Although the British do not seem to be very much ahead at the present moment on this subject, it is very curious if you look back, to see how ideas have originated in that country. The first British machine of this kind was to be driven by propellers, after the manner of the machine used by the Wright Brothers. If you look at pictures of the machine they then had, you will see that if they could have made an engine light enough for it the machine would have flown. This is undoubtedly the machine that has developed into the modern machine. The work of Maxim has developed great principles, though his machine never flew, from inherent instability. It showed how inventions should proceed. The machine was lifted from the 21 10 rails by its own motive power, in fact it tore the rails up. In America, Langley was one of the first to lift up the whole subject of aerodromics to the scientific plane. Before that time, and even later, when people spoke of machines heavier than air, they were liable to hear quoted the words about Darius Green and his flying machine, and it was quoted so often to Langley, whose machine was never tried, that he died of a broken heart over newspaper censure.

Langley's Experiments .

I must not keep you too long with these preliminaries but must tell you what you are interested in as Canadians, and that is the new organization which has come into the work, second only in importance to the improved aerodromes, and that is the new agency of a co-operative scientific association, not for gain but for the love of the art and doing what we can to help one another. As it sprung into being in my Laboratory, it may be well for me to say a few words about it. I was always interested in flying machines. I was one of the spectators of Langley's aerodrome with a fifteen foot spread of wings. This, I think, was in 1896, and the sight was presented to us then of a steam engine, flying in the air with wings like a bird. I saw it fly, photographed it in the air, and the photographs are the only record of that magnificent flight of a mile with no man aboard. Any one who saw it, as I saw it, must have felt that the age of the flying machine was at hand. At the expense of the American War Department, Prof. 22 11 Langley tried to build a machine of the same type, but of a size to carry a man. I think that the War Department contributed $50,000,000

The machine never got a fair test because of accidents in the launching ways, due to the ways and not the machine.

Of course, it was no more a failure of flight than to have a ship caught in the ways in launching would be proof that she would not float. But the result was proof enough for the disgruntled newspaper men that she would not fly, and the result of this disagreement with the newspaper men was that Langley could not get more money to repair the machine. And it broke his heart. Not long afterwards he had a stroke of paralysis which his friends knew little about, and the second stroke carried him off. He was a man of very sensitive feelings, and I believe that the unjust criticisms of the newspapers contributed to his death. Before he died, by the aid of private funds he had the machine put into condition, and it now hangs, in its original form, in the National Museum. I speak of Langley because he was our modern pioneer, and he was the scientific man who lifted the art to the plane of scientific investigation. I was closely associated with him. He was Secretary of the Smithsonian Institution, and I was a Regent, so we knew one another intimately. I knew of his work and he of mine. After his death, I pushed my work in the same line more prominently forward. Up to that time I had only played with the subject.

23

12 The Experiments at Baddeck .

I had been interested in kite-flying, not the kites that little boys fly with strings, but big structures that would lift a man into the air. I was interested in this because of its bearing on the subject of aeronautics. I wished to carry up a man in the air, then add a propeller and see what it would do. My kite differed from other kites in one important respect. Other kites,in a gust of wind, will dance about, but my kites for some reason are perfectly stable in the air, even under circumstances of gusty wind. In aerial machines what we want above all things is automatic stability, and this quality is possessed by these tetrahedral kites. I wanted to see what could be done with an engine to propel one of these with a man aboard. The first thing was to put up a man. I found I had not the necessary technical knowledge. I did not feel confidence in putting up a man in one of these structures without an opinion from some competent engineer. So, I associated myself with two young Canadian engineers, just graduated from Toronto University, to give me the necessary technical knowledge. One of these young men, Douglas McCurdy of Baddeck, is a son of A.W. McCurdy now of British Columbia, and a grandson of Hon. David McCurdy, formerly a legislative Councillor of Nova Scotia. He is a young engineer, full of enthusiasm, brave and fearless. He is the one who has been making the recent flights. He came to me as Assistant Engineer to help me design the engineering 24 13 structure. The other is a young man of pre-eminent ability, Mr. F.W. Baldwin. His father is not living, but he is a grandson of Hon. Robert Baldwin, one of the founders of your country. (Applause). And, if Robert Baldwin were living to-day, I do not think he would be at all ashamed of his descendant. F.W. Baldwin is a young man of 29, one who will be a great acquisition wherever he goes. These men afforded the necessary engineering ability to decide whether my structures were built on sound engineering lines. But there was another thing to be done. We did not know about motors, so we tried to find the best man to help us in that respect. So, I brought to Baddeck a man who, though only 28 years of age, had made a name for himself, Mr. Glen H. Curtiss, of Hammondsport, New York. He had opened a little motor shop in Hammondsport, and had built up a business for himself which was perfectly astonishing. He is now recognized all over America as our foremost motor expert. He came to Baddeck to help in putting in our engine, and we got another helper whose coming pleased me very greatly. This was a young Officer of the United States Army. I must confess, with all my kindly feelings for Canada, I was a little concerned at the point that all the people associated with me in Baddeck and the workmen in my Laboratory, except Mr. Curtiss, were Canadians. Here was one who belonged to my adopted country, the United States. Therefore I welcomed him all the more. This was the late Lieut. Thomas Selfridge, of the United States War Department. He had made a specialty of flying machines. He was bright 25 14 enough to know that the time was coming when the United States Army would need such things, and he knew that, when that time came, a young Officer that knew about them would be of great benefit to his country. So he began to make himself an expert, and wanted to see what we were doing at Baddeck, in the interest of the United States War De a p art ?? me nt. I said, ‘Come along, we want the War Department of the United States to know what we are doing, so that, if there is any benefit, the United States may share in it as well as Canada’. So Lieut. Selfridge was sent by the War Department of the United States to come up and observe our experiments. So, here we were, living in my house myself, an elderly man, surrounded by brilliant young men each an expert in his own line. We become very friendly. My wife became very much attached to them all. Besides the property my wife has coming from my invention, she had a property that I have nothing to do with, a little corner lot that has been going up in value, she said: ‘Why don't you make an Association. I will put up this lot of land that my husband has nothing to do with as the fund to support the Association. So, this Aerial Experiment Association came into existence with these members, myself, Mr. McCurdy, Mr. Baldwin, Mr. Curtiss, and Lieut. Selfridge, and with the working capital contributed simply for the love of it, without any intention of making anything out of it, which working capital amounted to $35,000.00. With the providing of that I had nothing to do, I come in as one of these young men on equal terms. We had similar ideas; they 26 15 wanted to help me and I wanted to help them. I wanted to give them a start in life and develop their individuality. So, we agreed that we would work together purely in the interest of the art. As Lieut. Sel ? f ridge said: ‘All we want is to get into the air’. All our machines are joint productions, but each one has a machine built on plans approved by him. As I have said we have five finished. We call them ‘dromes’, we have got past calling them ‘aerodromes’. In fact, we speak of ‘droming’ from place to place. I do not know whether the word will take or not.

Canada's Opportunity.

Now I do not know how long one is expected to speak before the Canadian Club (Cries of “Go on, go on”) I will hand around some photographs I have of the aerial experiment navigation. Now, our funds are out and this Association dissolves by time limitation on the 31st of this month. We have gone a little beyond the experimental stage having built four dromes that have flown and a fifth that is fluttering its wings, while we have a sixth that is not completed. Some of our fledglings having proved their ability to and look out for themselves. Personally fly, we are going to let them fly. I do not care about commercial matters. I will go on with my experiments in tetrahedral structures. Mr. Curtiss intends to carry on the manufacture of aerodromes in Hammondsport, N.Y. Mr. McCurdy and Mr. Baldwin are a little different. They say they are Canadian t s , and they want to go into the practical manufacture of these machines. But they say: ‘Cannot 27 16 we do anything for the Canadian Government? I told them I did not know, but I would be glad to help. I said: ‘I am going up to Ottawa to talk to the Canadian Club, and I believe it probable that I shall have a seat at the same table with His Excellency and Mr. Fielding and other members of the Cabinet; perhaps something will turn up, we can't tell’ (Laughter and applause). I said to these young men:— ‘I don't care to go into this thing, but what do you want? There answer was, ‘We are Canadians; if we can do anything for the Canadian Government we want to do it; if not, we want to do it for the British Government; or if not that, then we want to go in for ourselves and treat with any other Government, because Governments must afford the market for these machines’. And now I have come here. I have talked to Mr. Fielding, and have put a few ideas into His Excellency's mind; and something may come of it. Though I cannot claim to be a Canadian, except that I have a warm spot in my heart for Canada, I do want Canada to have the benefit of these Canadian boys. (Applause). I want to have the British Government have the benefit of them; and I would like to see some plan develop to that end. I do not know what that plan shall be; it is in the air. When our Association dissolves on March 31st, I want to say to these young men, ‘Go ahead on this work for Canada’ or else, go ahead for yourselves’.

Now, I have exceeded my reasonable time, so I will sit down leaving these photographs to be handed around showing the machines that we have constructed“. (Loud and prolonged applause).

28

17 The Governor General .

His Excellency Earl Grey was called on by President Edwards. “In my capacity as representative of the crown,” said His Excellency, “I desire to welcome Dr. Graham Bell among us this afternoon. I may tell Dr. Graham Bell that, thanks to the efforts of the newspaper men, who are determined from the standpoint of Canada to compensate for the injury done in the case of Mr. Langley, every part of the British Empire is watching with interest and hope the experiments in Baddeck Bay. We are all growing conscious of the fact that that Nation which has the best airships, the best 'dromes' will obtain that supremacy in the air which the British Empire to-day possesses, and, will I hope for all time, possess upon the seas. (Applause). The question is, who is to have the credit, the honor and the glory to give to the British Empire that machine? Listening to the speech of Dr. Graham Bell this afternoon, I think there is but one hope that animates us in this matter, and that is that Canada will be that country. (Renewed and long continued applause). We have heard that Canada can boast of the honor of having invented the principle of the telephone. Canada can boast of the honor of having been the first country to apply that principle. We also know that it is owing to the liberality of the Canadian Government that Mr. Marconi was enabled to continue the experiments as a result of which he has given to the world the advantage of the wireless system of telegraphy. I believe that every single person 29 18 whose life was saved upon that sinking ship a few days ago owes the enjoyment of his life to the liberality of the Canadian Government. It only remains for Canada, which gave to the world the telephone and wireless telegraphy, to complete her services to the British Empire, and to civilization by giving to the world the best aerodrome, the possession of which will make the nation that is fortunate enough to own it, to quote Dr. Graham Bell, "the foremost Nation of the world". (Loud and prolonged applause).

Minister of Finance .

Hon. W.S. Fielding, Minister of Finance, referred to his personal acquaintance with Prof. Bell, who has a summer home in Nova Scotia.

"The gentleman of whom he spoke to us, Mr. Douglas McCurdy" said Mr. Fielding, "is a grandson of a man with whom I was associated for many years in the public life of my province and three generations of whose family I have known intimately. I am glad to know that this young man is going to make his mark in the world of science. What we can do for these young men is the question. I had the pleasure of calling the attention of His Excellency to the achievements of Mr. McCurdy and Mr. Baldwin, and he took a kind interest in the matter and reported to the Imperial authorities their experiments with airships with a view to call-in the attention of the Imperial War Department to them. Our War Department though some say is very costly, has not yet indulged in the luxury of an airship. I do not know what 30 19 may happen. Of course we have made our pious resolves against expenditure, but after the address that we have heard to-day I fear that Sir Frederick Borden will have dangerous intentions upon the Finance Department. Other Ministers can sometimes speak rashly with regard to expenditures, the Minister of Finance always speaks under reserve. But I think that the presence of this great gathering, and I wish to say to Dr. Graham Bell that this is one of the greatest gatherings held by the Canadian Club of Ottawa, and in that respect he is honored as he deserves to be, is an indication that there will be new and increasing interest in this work. And if it is found possible for the Government of Canada to do something to help on this movement something to recognize the work of these two devoted young Canadians and keep their names and fame and services for the Empire no one will be more pleased than myself."

APPENDIX A .

MINUTES OF THE MEETINGS OF THE AERIAL EXPERIMENT ASSOCIATION .

1907, October 1, Tuesday :— Messrs. Alexander Graham Bell, G. H. Curtiss, F.W. Baldwin, J.A.D. McCurdy, and T. Selfridge, 1st Lieut. U.S.F.A., met together in the Halifax Hotel, Halifax, N.S. at 11.00 A.M. Tuesday, Oct. 1, 1907. They were presented with the following article of agreement, which they had signed the previous day before a Notary Public whose signature was duly authenticated by the American Consul General at Halifax, by Dr. Bell.

Agreement to Organize the Aerial Experiment Association .

WHEREAS, the undersigned Alexander Graham Bell of Washington, D.C., U.S.A., has for many years past been carrying on experiments relating to aerial locomotion at his summer laboratory at Beinn Bhreagh, near Baddeck, N.S., Canada, and has reached the stage where he believes that a practical aerodrome can be built on the tetrahedral principle driven by an engine and carrying a man, and has felt the advisability of securing expert assistance in pursuing the experiments to their logical conclusions, and has called to his aid Mr. G.H. Curtiss of Hammondsport, New York, an expert in motor construction, Mr. F.W. Baldwin, and Mr. J.A.D. McCurdy, of Toronto, Engineers, and Lieut. T. Selfridge, 5th Field Artillery, U.S.A., military expert in aerodromics, and

WHEREAS, the above named gentlemen have all of them given considerable attention to the subject of aerial locomotion, and have independent ideas of their own which they 2 desire to develop experimentally, and

WHEREAS, it has been thought advisable that the undersigned should work together as an Association in which all shall have equal interest, the above named gentlemen giving the benefit of their assistance in carrying out the ideas of the said Alexander Graham Bell, the said Alexander Graham Bell giving his assistance to these gentlemen in carrying out their own independent ideas relating to aerial locomotion, and all working together individually and conjointly in pursuance of their common aim “to get into the air” by the construction of a practical aerodrome driven by its own motive ? p ower and carrying a man;

NOW THEREFORE, we, the undersigned Alexander Graham Bell, G.H. Curtiss, F.W. Baldwin, J.A.D. McCurdy, and T. Selfridge do hereby agree to associate ourselves together under the name of the "Aerial Experiment Association", for the purpose of carrying on experiments relating to aerial locomotion with the special object of constructing a successful aerodrome.

We agree that the "Aerial Experiment Association" shall be organized on the first day of October, 1907, and shall exist for the term of one year from that date of organization unless otherwise determined by the unanimous vote of the members.

We agree that the inventions relating to aerial locomotion made by the members of the Association during the lifetime of the Association shall belong to the Association; and that any applications for letters patent for such inventions 3 shall be made in the names of all the members as joint inventors.

We agree that inventions relating to aerial locomotion made by the members of the Association before the organization of the Association shall belong to the inventors and not to the Association unless specially assigned; and that only such prior inventions shall be c a l aimed by individual members as shall be substantiated by the production of written memoranda, drawings, photographs, or models existent before the date of the organi x z ation, so that the proofs of prior invention shall not rest on recollection alone, or upon verbal statements unsupported by documentary or tangible evidence of earlier date than the organization of the Association.

The said Alexander Graham Bell agrees to place his Laboratory at Beinn Bhreagh, near Baddeck, Nova Scotia, at the disposal of the Association for the purpose of carrying on experiments relating to aerial locomotion, together with all the buildings, tools, materials and appurtenances belonging to the Laboratory, without charge, so long as the Association desires to carry on experiments at Beinn Bhreagh, provided that the running expenses of the Laboratory, including the salaries of the Superintendent and men employed shall be paid by the Association during their use of said Laboratory, the number of men employed other than the Superintendent to be at the discretion of the Association, and that any new material or apparatus not in the Laboratory at the date of the organization which may be desired for the 4 use of the Association shall be acquired at the expense of the Association.

We, the undersigned agree to appoint one of our number as Director of Experiments to be our medium of communication with the Laboratory.

We agree that the Laboratory workmen shall receive their instructions from the Superintendent of the Laboratory alone, that the Superintendent of the Laboratory shall receive his instructions from the Director of Experiments alone, and that the Director of Experiments shall receive his instructions by vote of the Association of which he is a member.

We agree that the Headquarters of the “Aerial Experiment Association” shall be at Beinn Bhreagh, near Baddeck, Nova Scotia, and that, on or before the first of Jan. 1908, the Headquarters of the Association shall be removed to some place yet to be determined within the limits of the United States.

This agreement can only be modified by unanimous vote of the undersigned.

Witness our hands and seals at Halifax, N.S. this thirtieth day of September, A.D., 1907.

(Signed) Wm. L. Payzant Notary Public Nova Scotia

(Signed) Alexander Graham Bell

(Signed) G.H. Curtiss

(Signed) F.W. Baldwin

(Signed) J.A. Douglas McCurdy

(Signed) T. Selfridge, 1st U.S.F.A.

Authenticated by David F. Wilder, Consul General of the United States, Sept. 30, 1907.

5

Dr. Bell proposed that the above agreement be accepted and that they proceed with the organization. This was unanimously agreed to.

The election of Officers was then in order. It was moved and seconded that Alexander Graham Bell be elected Chairman of the Association. Motion carried unanimously.

In like manner T. Selfridge was elected Secretary and J.A.D. McCurdy Treasurer.

The Association then appointed G.H. Curtiss, Chief Executive and Director of Experiments, and F.W. Baldwin, Chief Engineer.

The duties of the Secretary were further extended to include those of Recorder of Experiments and Librarian; and those of the Treasurer to Photographic Recorder of Experiments, and Asst. Engineer.

The Association adjourned to meet at the call of the Chairman at Beinn Bhreagh, N.S. (Signed) T. Selfridge, Secretary.

1907, October 2, Wednesday :— The Association met in accordance with the previous adjournment at 8.30 P.M., Wednesday, Oct. 2, 1907.

Present:— All the members.

The minutes of the previous meeting were read by the Secretary. It was moved and seconded that the minutes be accepted. Motion adopted.

The Association then proceeded to the discussion of ways and means. The Secretary read the following note from Mrs. A. Graham Bell.

6

Beinn Bhreagh, near Baddeck, Oct. 2, 1907. To the Members of the Aerial Experiment Association.

Gentlemen:— I am very happy to hear of the organization of the Association upon the success of which my heart is set.

I shall be glad to advance it funds from time to time as may be requested by the proper officers for the purpose of enabling the Association to carry on experiments relating to aerial locomotion, providing the total amount advanced does not exceed, in the aggregate the sum of twenty-thousand dollars ($20,000.00)

Yours sincerely, (Signed) Mabel G. Bell.

It was moved and seconded that Mrs. Bell's offer as embodied in the above note be accepted. Motion unanimously carried.

Moved and seconded that the Secretary be instructed to thank Mrs. Bell for her offer. Motion unanimously carried.

Moved and seconded that Mrs. Bell be given a 1% interest (one per cent) in all proceeds resulting from the work of the Association for every $1000 she contributes. Motion unanimousl t y adopted.

Moved and seconded that no further contributions be accepted, or funds raised, without first applying to Mrs. Bell or members of the Association. Motion unanimously adopted.

Moved and seconded that Dr. Bell's offer of the use of his Laboratory set forth in the agreement appearing in the minutes of the previous meeting be accepted. Motion unanimously adopted.

7

Moved and seconded that the Secretary be instructed to thank Dr. Bell for his offer. Motion unanimously adopted.

Moved and seconded, that, as funds are desired, the Secretary be instructed by note to notify Mrs. Bell, and request her to send cheque of amount to Treasurer. Motion unanimously adopted.

Moved and seconded that all funds of the Association be deposited to its credit by the Treasurer in such bank as the Association may elect. Motion unanimously adopted.

Moved and seconded that all expenses of Association be met by cheque by the Treasurer. Motion unanimously adopted.

Moved and seconded that the Association shall select some person, not a member of the Association, to periodically audit the Treasurer's accounts. Moti ? o n unanimously adopted.

Moved and seconded that the Treasurer shall be required to give a bond. Motion unanimously adopted.

Moved and seconded that all the Treasurer's cheques on the Beinn Bhreagh Laboratory account shall bear the endoresment of the Director of Experiments. Motion unanimously adopted.

Moved and seconded that Association adjourn to meet at the call of the Chairman. Adopted. Association adjourned at 11.45 P.M. (Signed) T. Selfridge Secretary.

8

1907, October 3, Friday :— The Association met in accordance with the previous adjournment at 10.00 P.M.

Present: All the members.

The minutes of the previous meeting read by the Secretary. Moved and seconded that the minutes of the previous meeting be adopted. Motion carried.

The following suggestions as to salaries were read by the Chairman.

That Mr. Curtiss, as Chief Executive, and Director of Experiments in special charge of motive power, receive $5000.00 per annum.

That Mr. Baldwin as Engineer in Chief in special charge of construction receive $1000.00 per annum.

That Mr. McCurdy as Treasurer and Asst. Engineer in special charge of Photograhpic Records receive $1000.00 per annum.

That Mr. Selfridge, in accordance with his own suggestion, as he has been detailed here as an observer by the United States Government, on full pay, receive no salary.

That Dr. Bell should also serve without compensation, as he does not wish to measure the value of his services by receiving a salary.

Mr. Curtiss then submitted the following statement to be read by the Secretary, embodying his views on the matter.

“To the Aerial Experiment Association”:—

Having been honored by the appointment of Director of Experiments, I wish to make the following statement.

In the first place I must say that I am thoroughly in 9 accord with the plan, and feel honored to have an opportunity to associate myself with Dr. Bell, and the men who constitute the Association; and also express my admiration for Mrs. Bell, who conceived the idea and made the Association possible. I am sure it will be a success and trust its achievements will fully repay Mrs. Bell for her efforts.

When Mrs. Bell first made known her proposition I was not in a position to devote much time to the scheme, owing to my rather rapidly growing business, which I felt would not be made to pay without my personal and constant attention. In talking over my plans with Messrs. Bell, Baldwin, McCurdy and Selfridge, I stated that I believed arrangements could be made whereby I could give a large part of my time to the undertaking. A plan was formed in which I could give an active part and receive a salary of $5000.00 per year. With this in view I carried on negotiations to transfer my business to a new company which, however, necessitated my giving up a large part of my interest in business, but, enabled me to absent myself much of the time by turning over the brunt of my work to others.

As to the Association, my plan is to devote my self entirely to its interest, with the exception of the time required to handle important matters of my company. I shall be at the “scene of action” as much as possible, but when not, I shall be constantly working to further the interests of the organization.

Aside from the actual necessity of my continued identity with the Curtiss Company, I think it quite desirable 10 that the “Aerial Experiment Association” be in touch with such a company backed by prominent men with plenty of capital which could take hold of the commercial end of the Association's achievements.

However, if thought advisable as a further incentive for me to give a large part of my time entirely to the Association, I would propose that instead of being paid a fixed salary of $5000.00 a year, I receive only half pay while not actually at the scene of operations or headquarters of the Association.

Mr. Baldwin then stated that he was willing to devote his whole time to the interests of the Association, and that $1000.00 per annum was satisfactory to him.

Mr. McCurdy was also willing to give all his energies to the Association, the sum of $1000.00 therefore being agreeable to him.

Mr. Selfridge then moved that the following salaries be paid by the Association to its members: Mr. Curtiss $5000.00 per annum, receiving half pay when not actually at the scene of operations or headquarters of the Association.

Mr. Baldwin $1000.00 per annum, and Mr. McCurdy $1000.00 per annum. The motion was seconded and adopted.

Moved and seconded that during the absence of any of its members, the Association may appoint a temporary substitute. Motion carried.

Moved and seconded that the Association adjourn to meet at the call of the Chairman. Carried. Association 11 adjourned at 11.05 P.M. (Signed) T. Selfridge, Secrnetary.

<u>1907, October 13, Monday</u> :— The Association met in accordance with the previous adjournment at 10.00 P.M.

Present:— A.G. Bell, McCurdy, Baldwin, Selfridge.

Absent:— G.H. Curtiss.

The Secretary read the minutes of the previous meeting. Moved and seconded the minutes of the previous meeting be accepted. Carried.

Moved and seconded that Mrs. Bell be notified of manner in which she was to be reimbursed for her contributions. Carried.

Moved and seconded that Mr. Baldwin act as Director of Experiments during the absence of Curtiss. Carried.

Moved and seconded that Mrs. Bell be requested to advance $2000.00 to the Association. Carried.

Moved and seconded that the Treasurer open an account in the Baddeck Branch of the Union Bank of Halifax in the name of the Aerial Experiment Association. Carried.

Moved and seconded that the members of the Association come together each day at the headquarters of the Association for the purpose of discussion. Carried.

Moved and seconded that the Association adjourn to meet at the call of the Chairman. Carried.

The Association adjourned at 12.00 midnight. (Signed) T. Selfridge, Secretary.

1907, November 1st, Friday :— The Association met in accordance with the previous adjournement at 10.00 P.M.

12

Present:— A.G. Bell, F.W. Baldwin, J.A.D. McCurdy, and T. Selfridge.

Absent:— G.H. Curtiss.

The minutes of the previous meeting were read by the Secretary. Moved and seconded that the minutes of the previous meeting be adopted. Carried.

The Treasurer stated that he had deposited the $2000.00 contributed by Mrs. Bell in the Baddeck Branch of the Union Bank of Halifax to the account of the Aerial Experiment Association.

There was a general discussion of the future plans of the Association.

Moved and seconded that the meeting adjourn to meet at the call of the Chairman. Adopted. The Association adjourned at 11.20 P.M. (Signed) T. Selfridge, Secretary.

1907, November 15, Friday :— The Association met in accordance with the preceding adjournment at 4.00 P.M.

Present:— A.G. Bell, J.A.D. McCurdy, T. Selfridge.

Absent:— G.H. Curtiss and F.W. Baldwin.

The reading of previous minutes omitted.

Moved and seconded that the Treasurer in his capacity as Photographic Recorder of experiments be allowed a sufficient sum to permit his h ? i ring an asst. Carried.

The Secretary was directed to draw up a motion to the effect that a gliding machine be constructed; this matter having been discussed at the meeting. The Association adjourned to meet at the call of the Chairman at 5.30 P.M. (Signed) T. Selfridge, Secretary.

13

1907, December 7, at House :— The Association met in accordance with the preceding adjournment at 3.00 P.M.

Present:— A.G. Bell, J.A.D. McCurdy, F.W. Baldwin, T. Selfridge.

Absent:— G.H. Curtiss.

Moved and seconded that the minutes of previous meeting as read by Secretary be accepted. Carried.

The following resolution was presented and adopted.

Whereas, for the purpose of training the members of the Association as aviators, that they may be in position to successfully handle the flying machine the Association is to construct, Lieut. Selfridge is anxious to make experiments with a gliding machine modelled after the machines that have been successfully used in America and France, both as ? g lid e i ng machines and flying machines propelled by their own power.

Resolved, that the Association aid him in constructing and making such a machine in accordance with his plans.

Moved and seconded that the gliding machine mentioned in the preceding resolution be constructed at Hammondsport under the direction of Mr. Curtiss. Adopted.

Moved and seconded that the meeting adjourn. Adopted.

The meeting adjourned to meet at the call of the Chairman at 4.00 P.M. (Signed) T. Selfridge, Secretary.

<u>1907, December 23, Monday</u> :— The Association met in accordance with the preceding adjournment at 4.00 P.M.

Present: All the members.

Moved and seconded that the minutes of the previous Probably December 24, Tuesday, J.A.D. McC. Sec. 14 meeting, as read by the Secretary be adopted. Carried.

Moved and seconded that the headquarters of the Association be transferred for the present to Hammondsport, New York. Adopted.

? G eneral discussion as to plans followed.

Moved and seconded that the meeting adjourn to meet at the call of the President. Adjourned 4.45 P.M. (Signed) T. Selfridge, Secretary.

1908, March 26, Thursday :— The Association in accordance with the previous adjournment met at 9.45 P.M.

Present:— Curtiss, Baldwin, McCurdy, and Selfridge.

Absent: A.G. Bell.

Mr. Curtiss acted as Chairman. The Secretary read the minutes of the previous meeting.

Moved and seconded that the minutes be accepted. Carried.

Moved and seconded that the Secretary put in a requisition to Mrs. Bell, to be paid as soon after April 15th as convenient, for $3000.00 to consist of the following items.

Mr. Curtiss' Salary $1500.00

Expenses incurred in shop 400.00

“ “ by Secretary 300.00

Current expenses 800.00

$3000.00

Carried.

Moved and seconded inasmuch as Aerodrome No.1 called the “Red Wing” had been so badly damaged during a trial on March 17th as to be beyond repair and as it had given promise of being able to accomplish far more than has yet been obtained from this type, that another aerodrome, to be known as 15 aerodrome No.2, be constructed under Mr. Baldwin's supervision, with the aid of the other members of the Association along much the same lines as aerodrome No.1, with certain departures suggested by the trials with aerodrome No.1. Carried.

The Secretary then read the following letter and submitted the matter to the Association for instructions.

Glen Ridge, N.J. March 21, 1908. Lieut. Selfridge, U.S.A., Hammondsport, N.Y.

Dear Sir:— My cousin Lieut. Lahm has already spoken to you of my desire to be of assistance to you this summer. I thought I would write to you also to make sure of my being remembered. I am very much interested in the kind of work you are doing and should be pleased to be connected with it in any way. I shall finish the Sophomore year at Stevens about the tenth of June when I shall be free till the latter part of September.

Hoping you will consider the matter favorably, I amd truly yours, (Signed) Ralph H. Upson.

Moved and seconded, that inasmuch as the Association was made up of men capable of handling the different phases of the problems it expected to have to solve, it was not deemed essential or advisable to enlist the services of outside talent. Mr. Upson be notified to that effect by the Secretary, but also that the Association would have no objection to his following their experiments during the next summer 16 should he care to do so. Carried.

Moved and seconded that the meeting adjourn to meet at the call of the Chairman. Carried.

Adjourned at 10.30 P.M. (Signed) T. Selfridge, Secretary.

1908, April 7, Tuesday :— The Association met in accordance with the previous adjournment at 3.07 P.M.

Present: a A ll the members.

The Secretary read the minutes of the previous meeting.

Moved and seconded that the minutes of the previous meeting be adopted. Carried.

Moved and seconded that the Association build a catamaran to continue experiments with at Baddeck. Carried.

Moved and seconded that the Engineer draw plans of a catamaran and set work going on matter. Carried.

Mr. Williams and Mr. Bedwin were called in and consulted as to best form of hull to be used.

The Treasurer read the following statement:—

Total receipts to Mar. 31 $5000.00

Total expenditures 4955.54

Bills payable 3374.51

Total $8330.05

Deficit $3330.05

The reports of the Treasurer submitted on Jan.17th and April 7th are appended hereto for reference.

Moved and seconded that Mr. L.D. Masson audit the reports of the Treasurer up to Mar. 31, 1908.

Whereas it has been found advisable to change the monitor for a requisition for $3000.00 in view of the above statement 17 submitted by the Treasurer as made at the meeting of March 26, to $5000.00.

Resolved, that the Secretary make a requisition on Mrs. Bell for $5000.00 in order that the Association may continue its experiments.

Moved and seconded that the above resolution be adopted. Carried.

Whereas Lieut. Selfridge has given his time and services freely to the Association without salary, and has incurred expenses personally incident to his position as Secretary therefore,

Resolved that the Treasurer be authorized to pay Lieut. Selfridge the sum of $500.00 to cover the expenses of the Secretary's office for the six months ending Mar. 31, 1908.

Moved and seconded that the above resolution be adopted. Carried.

The Secretary requested that he be instructed as to the manner of answering letters requesting help by outsiders also those containing suggestions regarding the construction of an aeroplane or other flying machine.

Moved and seconded that the Secretary inform persons who are kind enough to offer information that the Association will be very glad to receive information so long as it is not of a confidential character. Carried.

Moved and seconded that the Association adjourn to meet at the call of the Chairman. Carried. Meeting adjourned at 4.00 P.M. (Signed) T. Selfridge Secretary.

18

1908, May 4, Monday :— The Association met in accordance with the previous adjournment at 3.30 P.M.

Present:— All the members.

The Secretary read the minutes of the previous meeting.

Moved and seconded that the minutes of the previous meeting be adopted. Carried.

The Treasurer reported that $5000.00 had been received in response to a requisition for same upon Mrs. Bell.

The following report was submitted by the Treasurer:

Balance in Bank $ 13.88

Receipts 5000.00

Expenditures 4065.19

Balance on hand $ 948.68

Detailed report append ed.

The Engineer stated that Aerodrome No.2 was practically completed. The running gear only remaining to be installed.

The Engineer was directed to submit a report on the progress in regard to a catamaran at the following meeting.

Moved and seconded that members submit papers on the following subjects:—

Baldwin on differences between Aerodrome No.1 and Aerodrome No.2. Curtiss on motors. Selfridge on the subject of Aviation. Carried.

Mr. Post, Secretary of the Aero Club of America was present at the meeting. Mr. Post suggested that the Association give an exhibition with aerodrome No.2 in New York or vicinity after the completion of successful trials at Hammondsport. Also requested correspondence with Aero Club 19 on subject of experiments.

The suggestion was favorably received.

Moved and seconded that the Association adjourn to meet at the call of the Chairman. Carried.

The Association adjourned at 4.30 P.M. (Signed) T. Selfridge, Secretary.

1908, May 8, Friday :— The Association met in accordance with the previous adjournment at 8.10 P.M.

Present: All the members. Also Messrs. Post, Bedwin and Williams.

The Secretary read the minutes of previous meeting.

Moved and seconded that the minutes of previous meeting be adopted. Carried.

The Engineer stated that he considered it advisable to order the parts of the boats for the catamaran from Brookes and Co., Michigan, to be shipped to Baddeck and assembled at Laboratory.

Moved and seconded that the Engineer order the necessary parts of catamaran from Brookes & Co. Michigan, as early as convenient. Carried.

Mr. Baldwin submitted a paper on the “Red and White Wing” accompanied with blue prints of same.

Mr. Curtiss read a paper on motors and the probable lines of future development of his motor.

Mr. Selfridge read a paper on the early history of Aviation.

It was moved and seconded that the above papers be turned over to the Secretary and that he retain them in 20 order as submitted, the collection to be known as “The Proceedings of the A.E.A”. Carried.

Moved and seconded that the following papers be submitted at the next meetings.

Mr. Baldwin to finish the treatment of his subject by the description of the machines in detail, the paper to be accompanied by drawings to be executed by both Baldwin and McCurdy.

That Mr. Curtiss contribute further on his subject of motors.

Selfridge to continue his article and bring it up to date, and Mr. Bell also contribute a paper on a subject to be later determined upon. Carried.

Moved and seconded that the Director of Experiments design and construct an arrangement for accurately measuring the brake horse-power of an engine. Carried.

Moved and seconded that the meeting adjourn to meet at the call of the Chairman. The Association adjourned at 10.00 P.M. (Signed) T. Selfridge, Secretary.

1908, May 17, Sunday :— The Association met in accordance with the preceding ad n j ournment at 9.30 P.M.

Present:— All the members. Also Mr. E.A. Selfridge, Mr. Augustus Post, W.F. Bedwin, J.W. Williams, and Karl Adams.

The Secretary read the minutes of the previous meeting Moved and seconded that the minutes be adopted. Carried.

The Engineer in Chief, Mr. Baldwin reported that an order had been made on Brookes & Co. Michigan, for the 21 necessary material to build a catamaran.

The following papers were submitted and read before the meeting:—

Mr. Curtiss on future of motor construction. Mr. Baldwin on construction of “Red and White Wing”

Mr. Selfridge on “Aviation”. Mr. McCurdy on tendency of aeroplane to overturn due to torque of propellers. Mr. Bell, atmospheric Pressure, and thoughts concerning light engines.

General discussion, Mr. Selfridge directed to submit a discussion of McCurdy's paper for the next meeting.

Moved and seconded that meeting adjourn to meet at the call of the Chairman. Carried.

Adjourned at 12.00 midnight. (Signed) T. Selfridge, Secretary.

1908, May 20, Wednesd ? a y :— The Association met in accordance with the preceding adjournment at 7.00 P.M.

Present:— All the members. Also Mr. Augustus Post, Secretary of Aero Club of America. The Secretary read the minutes of the previous meeting. Moved and seconded the minutes stand adopted. Carried.

Resolved that upon the conclusion of experiments with aerodrome No.2, Baldwin's “White Wing”, or not later than July 1, 1908 the headquarters of the Association be removed to Beinn Bhreagh, near Baddeck, N.S. The above resolution was adopted.

Resolved that, whereas we have had with us during experiments with aerodrome No.2, “Baldwin's White Wing” 22 Mr. Augustus Post of the Aero Club of America the Association tenders him its appreciation for the interest he has shown, and for the stimulus given by his presence here. Adopted.

Moved and seconded that the meeting adjourn to meet at the call of the Chairman. Carried. Adjourned at 10.30 P.M. (Signed) T. Selfridge, Secretary.

On June 21st requistion was made and filed for $1000.00.

1908, July 6, Monday :— The Association met in accordance with the preceding adjournment at 5.07 P.M.

Present:— Curtiss, Baldwin, McCurdy, Selfridge.

Absent:— A.G. Bell.

Mr. Curtiss was temporary Chairman. The reading of the previous minutes omitted. The following telegram was read to the meeting.

Pictou, N.S. July 6, 1908. To the Aerial Experiment Association, Hammondsport, N.Y.

If McCurdy wishes to follow on line of “June Bug” I recommend that McCurdy machine be now built at Hammondsport and headquarters be retained there for the present. In meantime don't run any risk of injuring “June Bug” until an application for a patent has been prepared. Would like Baldwin to help me in Baddeck soon as possible and when we are ready for motor would like all to come to Baddeck. If these plans are acceptable would simply let it be known that at my request further trials of “June Bug” will be postponed until another aerodrome has been completed, so that in case of 23 accident to one machine another will be available for experiments. Would say nothing about patents outside as that would stir up inventors to forestall us in the patent office. Telegraph reply to Baddeck. (Signed) Graham Bell.

McCurdy stated that he wished to start work on his machine at once, and the following resolution was adopted. Resolved that, whereas Mr. Bell has notified the Association that it would be premature for all the members to proceed at once to Baddeck as certain preliminary work must be completed there before they can begin their experiments, the Association retains its headquarters at Hammondsport till such time as it may be notified by Mr. Bell that the work at Beinn Bhreagh is at such a stage as to warrant the discontinuance of experiments here, and that the Association proceed at once with the construction of aerodrome No.4, which will be used jointly in the experiments with aerodrome No.3. The Secretary stated that the Association had won the right to have its name the first inscribed on the Scientific American Trophy by the flight made by Mr. Curtiss on July 4th of 5090 feet (Total 1697 yards) in 102 ½ seconds before the Contest Committee of the Aero Club of America in aerodrome No.3, Curtiss' “June Bug”.

Moved and seconded that the meeting adjourn to meet at the call of the Chairman. Adjourned at 6.15 P.M. (Signed) T. Selfridge, Secr t e tary.

1908, July 10, Friday :— The Association met at the call of the Chairman pro temp.

24

Present:— Curtiss, Baldwin, McCurdy, Selfridge.

Absent:— A.G. Bell.

Reading of minutes of previous meeting omitted. The Treasurer notified the Association that he would shortly be in need of funds to the amount of $4000.00.

Moved and seconded that the Secretary be directed to make a requisition on Mrs. Bell for $4000.00 for the purpose of carrying on the Aerial Experiments. Carried.

Moved and seconded that the Association adjourn to meet at the call of the Chairman. Carried. Adjourned at 10.30 P.M. (Signed) T. Selfridge, Secretary.

1908, Sept. 21 : A meeting was held on Sept. 21, 1908 by order of the Chairman, at 1331 Connecticut Avenue, Washington, D.C. at 10.00 A.M.

Present:— A.G. Bell, G.H. Curtiss, F.W. Baldwin, and J.A.D. McCurdy.

Owing to the death of Lieut. Thomas E. Selfridge, J.A.D. McCurdy was elected Secretary as his successor.

Special business before the meeting was the framing of two resolutions in reference to the unfortunate accident at Fort Meyer which caused the death of our late Secretary. The following resolution was decided upon to convey to the parents of Lieut. Selfridge our sympathy in their great loss:—

Resolved that the Aerial Experiment Association place on record our high appreciation of our late Secretary, Lieut. Thomas E. Selfridge, who met death in his efforts to advance the art of aviation. The Association laments the loss of a 25 dear friend and valued associate; the United States Army loses a valuable and prominent Army Officer, and the world an ardent student of Aviation, who made himself familiar with the whole progress of the art in the interest of his native country.

Resolved, that a Committee be appointed by the Chairman to prepare a biography of our friend, the late Thomas E. Selfridge for incorporation into the records of the Association.

Resolved, that a copy of these resolutions be transmitted to the parents of Lieut. Thomas Selfridge.

Resolution No.2 which follows conveys to Mr. Orville Wright the idea that the members of the Association sympathize with him in his grief over the death of Lieut. Selfridge and hope for a speedy recovery from the injuries sustained by his fall.

Resolved, that the members of the A.E.A. herewith extend to Mr. Orville Wright their deepest sympathy for his grief at the death of their associate Lieut. Selfridge. We realize that in this pioneering of the air the unforseen must occasionally be disastrous. We hope sincerely that Mr. Wright will soon recover from the serious injuries he has sustained and continue in conjunction with his brother Wilbur Wright the splendid demonstration to the world of the great possibilities of aerial flight.

The meeting adjourned at 12 A.M. subject to the call of the Chairman. (Signed) J.A.D. McCurdy, Secretary.

26

1908, September 26 :— A meeting of the Association was held by order of the Chairman at 1331 Connection Avenue, Washington, D.C.

Members Present:— A. Graham Bell, G.H. Curtiss, F. W. Baldwin, and J.A.D. McCurdy.

Non-Members Present:— Mr. Edward A. Selfridge, J. S. Selfridge, S.W. Selfridge, Octave Chanute, G.H. Bell, and G.H. Grosvenor.

The Secretary read the minutes of the previous meeting which were approved.

The Chairman reviewed the condition which led to the formation of the Association, its work during the past year, and the probable plans for the Association in the future.

The Chairman also read an extract from a letter to him from Mrs. Bell in which she expressed so beautifully the place our late Secretary held in her heart.

Mr. Bell requested that a copy of this extract be prepared by the Secretary and transmitted to Mrs. Selfridge.

The Chairman went on to say that the Association would come to an end on Sept. 30, 1908 unless as stipulated by our constitution a unanimous vote of the members was obtained which would decide otherwise. He also pointed out that we might have inventions relating to our experiments which of a patentable nature would have some commercial value and if so the interests of the late Lieut. Selfridge would have to be considered in a legal fashion.

27

Mr. Bell also stated that he had been authorized by Mrs. Bell to say that she would be willing to donate money as wanted by the Association to the limit of $10,000.00 more to allow the experiments to be carried on for another period of six months. The following resolution was put and unanimously carried.

Resolved, that the legal representative of the heirs of our deceased member Lieut. Thomas E. Selfridge shall have the right to attend any of the meetings of the Association and vote at such meetings in the name and stead of the late Lieut. Thomas E. Selfridge; and that in all matters requiring the unanimous consent of the members that the consent of the said representative of the late Thomas E. Selfridge shall be required.

Resolved, that the Association recognize Mr. Edward A. Selfridge of No. 2615 California Street, San Francisco, California, as the legal representative of the late Thomas E. Selfridge.

In voting upon the resolution which follows an individual vote was taken Mr. Selfridge voting for the late Thomas E. Selfridge.

Resolved, that the Aerial Experiment Association be continued under its present organization for another period of six months ending March 31, 1909. The vote was unanimous.

The Chairman next brought up the matter of the appointment of a Trustee. There was considerable discussion 28 on this point and finally it was moved by Mr. McCurdy and seconded by Mr. Curtiss that the following resolution be put:—

Resolved, that Mr. Charles J. Bell, President of the American Security and Trust Company be appointed Trustee of the Aerial Experiment Association to receive and distribute the proceeds of the work of the Association in accordance with the article of agreement of organization and of resolutions of the Association.

An individual vote was taken, Mr. E. A. Selfridge voting in the name and stead of Lieut. Thomas E. Selfridge and the resolution was unanimously carried.

The Chairman next referred to an article prepared and written by Lieut. Thomas E. Selfridge for publication in one of the Bulletins of the Association and thought that it would be a good idea to have it published in book form for the information of the general public. Mr. Selfridge agreed to this providing that he could reasonably be assured that the statements made by Lieut. Selfridge in his article were correct, so that there would be no room for criticism which would be unpleasant.

The Secretary suggested that Mr. Chanute be asked to look it over with a view of correcting any statements as to facts, which were perhaps a little wrong. Mr. Chanute kindly consented to do this. It was moved by Mr. Curtiss and seconded by Mr. Baldwin that the headquarters of the Association be returned to Beinn Bhreagh, Nova Scotia, on October 1, 1908. Carried. A motion to adjourn subject to 29 the call of the Chairman was put and unanimously carried. Adjourned at 12.30 P.M. (Signed) J.A.D. McCurdy, Secretary.

1909, January 29, Friday :— A meeting of the Association was held at Beinn Bhreagh by order of the Chairman.

Present:— A.G. Bell, G.H. Curtiss, F.W. Baldwin and J.A.D. McCurdy, members. Non-members Gardiner H. Bell.

The Secretary read the minutes of the previous meeting which were approved. It was moved by Mr. Baldwin and seconded by Mr. Curtiss that Mr. K.J. McKay of Baddeck be asked to act as auditor of the Treasurer's accounts. The Treasurer was instructed to take steps in accordance with the above motion which upon being put to a vote was unanimously carried.

The Chairman then read a paper concerning patent matters from our patent firm, Mauro, Cameron, Lewis & Massie To this the Chairman had written a reply with which he favored the meeting.

The patent application was carefully gone over with special attention given to the claims.

The meeting adjourned at 11.00 P.M. to meet again subject to the call of the Chairman. (Signed) J.A.D. McCurdy Secretary.

1909, February 17, Wednesday :— A meeting of the Association was held at Beinn Bhreagh by order of the Chairman.

Present:— A. Graham Bell, G.H. Curtiss, F.W. Baldwin, J.A.D. McCurdy members. Non-members, Wm. F. Bedwin and G.H. Bell.

The Secretary read the minutes of the previous meeting 30 which were approved.

The Chairman read a letter before the meeting which he had forwarded to Mauro, Cameron, Lewis & Massie concerning patent matters. The following resolution was moved by Mr. Curtiss and seconded by Mr. McCurdy and unanimously passed.

Resolved that the letter of Dr. A. Graham Bell to Messrs. Mauro, Cameron, Lewis & Massie dated Feb. 2, 1909, a copy of which is appended be approved.

Copy of Approved Letter .

Beinn Bhreagh, Feb. 2, 1909. Messrs. Mauro, Cameron, Lewis & Massie, 620 F. Street, N.W., Washington, D.C.

Gentlemen:— Many thanks for your telegram of the 30th ult.

Messrs. McCurdy, Baldwin, and Curtiss are here, and have gone over very carefully with me your specification on the Hammondsport work of the Aerial Experiment Association; and, in accordance with the recommendation contained in your note of Jan.19 we have taken up the claims seriatim to ascertain who had, and who had not, contributed the subject matter of each claim.

As the results of our investigation we have unanimously come to the following conclusion:—

(1) McCurdy, Baldwin, Curtiss, Selfridge and Bell have each contributed to the subject matter of some of the claims.

(2) Mr. F.W. Baldwin alone has contributed the subject 31 matter of claims 1,2,3,4,5,6,7,8,9,10,11,13,14 & 16. Under these circumstances we should be glad to have your opinion as to whether it would be better to make this a joint application in the names of all the members of the Aerial Experiment Association, including Lieut. Selfridge; or to make two applications one in the name of Mr. F.W. Baldwin alone and the other a joint application.

We should be much obliged if, in deciding this matter you would consult with Mr. Charles J. Bell, who will act as, Trustee of the Association, and to whom, as such Trustee the patent should be assigned.

Yours sincerely, (Signed) Alexander Graham Bell.

The following resolution was moved by Mr. Baldwin and seconded by Mr. Curtiss, and upon being put to a vote was unanimously carried.

Resolved, that the telegram of Dr. A. Graham Bell to Messrs. Mauro, Cameron, Lewis & Massie dated Feb. 17, be approved.

COPY of APPROVED TELEGRAM

Beinn Bhreagh, Feb. 17, 1909. Messrs. Mauro, Cameron, Lewis & Massie, Washington, D.C.

Please go ahead with two applications as suggested.

(Signed) Graham Bell.

A third resolution was proposed by the Chairman seconded by the Secretary and upon being put to vote was unanimously carried.

32

Resolved that all patents granted to members of the Association or either of them be issued assigned to Mr. Charles J. Bell, Trustee of the Association.

Upon it being moved and seconded the meeting adjourned at 5.00 P.M. subject to the call of the Chair. (Signed) J.A. Douglas McCurdy, Secretary.

1909, March 31, Wednesday :— On March 31st 1909, Wednesday, a meeting of the Association was held at Beinn Bhreagh by order of the Chairman.

Present:— Members, A.G. Bell, F.W. Baldwin, J.A.D. McCurdy. Non-Members, Charles R. Cox, Mabel B. McCurdy, and Mrs. F.W. Baldwin.

The Secretary read the minutes of the previous meeting which were approved. Treasurer then read his financial report showing a credit balance to date of $151.99. The report was approved by the meeting and accepted. As the amount represented by bills payable amounted to about $6000.00 the Treasurer was instructed to make a requisition upon Mrs. Bell for the amount of $4000.00, this cheque to be made payable to Mr. Charles J. Bell, Trustee. This would bring her total contribution up to $35000.00 Discussion followed concerning the disposition of the tools and apparatus now belonging to the Association. It was finally moved and seconded:—

Resolved that the Association transfer all tools and apparatus now in their possession to Dr. A. Graham Bell, he agreeing to assume the liabilities of the Association for any sum over and above $35000.00. Adopted.

33

Considerable time was then spent in drawing up a letter of instructions to our Trustee Mr. Charles Bell. This letter follows:—

Beinn Bhreagh, March 31, 1909. Mr. Charles J. Bell, Trustee of Aerial Experiment Association, Washington, D.C.

Dear Sir: The Aerial Experiment Association of which you are Trustee expires to-night by time limitation, and all the property inventions and rights belonging to the Association now pass into your hands as Trustee to be disposed of as you think best in the interests of the members of the Association subject to the following conditions which contain the substance of the resolutions and agreement of the Association relating to the matter.

The property of the Association coming into your hands as Trustee to be sold by you as you think best in the interests of the members of the Association and the proceeds to be divided by you equally between Alexander Graham Bell, J.A. Douglas McCurdy, F.W. Baldwin, G.H. Curtiss and the heirs of the late Thomas E. Selfridge after paying over to Mabel G. Bell 1% of the proceeds for every thousand dollars she has contributed to the funds of the Association. This means that upon disposing of the property of the Association you pay over the proceeds as follows:

35% to Mabel G. Bell

13% to Alexander Graham Bell

13% to J.A. Douglas McCurdy

13% to F.W. Baldwin

13% to G.H. Curtiss

13% to Thomas E. Selfridge.

34

Two applications for United States patents have been prepared upon the Hammondsport work of the Association. One of these which has already been filed in the Patent Office is an application numbered 485,281 in the name of Mr. F.W. Baldwin as inventor which will be issued assigned to you as Trustee of the Aerial Experiment Association. The other which has not yet been filed in the Patent Office as it requires the signature of Mr. E.A. Selfridge administrator of the estate of the late Thomas E. Selfridge is a joint application in the name of Alexander Graham Bell, J.A. Douglas McCurdy, F.W. Baldwin, G.H. Curtiss and Thomas E. Selfridge. This application also if granted will be issued assigned to you as Trustee of the Aerial Experiment Association. The expenses of obtaining these patents have been assumed by me personally until such time as you can dispose of them in the interests of the Association, it being understood that you will transfer these patents to the purchaser of the inventions of the Association upon their refunding to me the amount exp?nded in obtaining the patents. The members of the Association assume that you will dispose of their inventions to some company for stock or cash which will be distributed in the proportion shown above. It has occurred to us that your work as Trustee could be greatly simplified if the members of the Association including the legal representative of the Late Thomas Selfridge shou d l d be organized in the form of a joint stock company. Then you could simply transfer all the property of the Association to this co ? mpany distributing the shares in 35 the proportion named.

Yours sincerely, (Signed) Alexander Graham Bell, Chairman of the A.E.A.

P.S. March 31, 1909: The above letter has been formally approved by the Association through the vote of the members here present, namely Mr. Douglas McCurdy, Mr. F.W. Baldwin, and myself.

I will send copies to Mr. Curtiss and Mr. Selfridge so that you may have the formal approval of all the interests involved. I will also communicate with you later submitting suggestions concerning the future of the A.E.A. work which has received the approval of the members here. A.G.B.

As has been stated in the P.S. this letter was unanimously approved by Mr. bell, Mr. Baldwin and the Secretary.

Mr. Baldwin and Mr. McCurdy submitted the following resolutions which after being put to a vote were carried unanimously.

Whereas, our Chairman Dr. A. Graham Bell realizing the importance of preserving systematic and accurate records of all experiments ideas etc. relating to the work of the A.E.A.,

Resolved that the younger members of the Association express their high appreciation of the results of the labors of Dr. Bell in that an interesting and valuable permanent records is in our possession under the name of the Bulletins of the A.E.A. of which we will always be proud.

Resolved further that the Association as a whole express to Mr. Charles R. Cox, and Miss Mabel Bell McCurdy 36 its gratitude and thanks for the untiring interest and help they have devoted in the preparation of the Weekly Bulletins.

The Secretary then moved the following resolution which received the ayes of all present,

Whereas the members of the A.E.A. individually and collectively feel that Mrs. A. Graham Bell has by her great personality, loyal support and inspiring ideas contributed very materially to any success the Association may have attained,

Resolved that we place on record our high appreciation of her loving and sympathetic devotion without which the work of the Association would have come to nought.

It was reluctantly moved by Mr. Baldwin and regretfully seconded by the Secretary that we dissolve, so by the stroke of 12.00 (midnight) the A.E.A. as an Association was no more. (Signed) J.A. Douglas McCurdy, Secretary.

BULLETINS OF THE Aerial Experiment Association

Bulletin No. XXXIX Issued MONDAY APRIL, 12 190?

APPENDIX B .

A Souvenir Volume of enlarged photographs illustrating the work of the Aerial Experiment Association.

ASSOCIATION'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell Editor

Gardiner H. Bell Assistant Editor

Charles R. Cox Typewriter

Mabel B. McCurdy Stenographer

Bulletins of the Aerial Experiment Association .

BULLETIN NO.XXXIX ISSUED MONDAY APRIL 12, 1909 .

APPENDIX B .

A Souvenir Volume of enlarged Photographs illustrating the work of the Aerial Experiment Association.

Beinn Bhreagh, near Baddeck, Nova Scotia.

To Mrs. Alexander Graham Bell

To whom the Aerial Experiment Association owes its being, and to whose loyal support the Association is indebted for all its successes.

This volume is dedicated.

APPENDIX B .

A Souvenir Volume of enlarged photographs illustrating the work of the Aerial Experiment Association.

1. Photograph of Mabel Gardiner Bell (Mrs. Alexander Graham Bell), founder of the Aerial Experiment Association.

2. Group of persons interested in Aerial Locomotion, including all the members of the A.E.A. Photograph taken at Hammondsport, N.Y., April 6, 1908.

(Standing — left to right)

Mr. T.S. Baldwin, who constructed the first dirigible balloon for the United States Government. (Not a member).

Mr. F.W. Baldwin, M.E. Toronto University; Chief Engineer of the A.E.A., who made the first public flight in America in a heavier-than-air flying-machine, March 12, 1908, in the Association's Drome No. 1, Selfridge's Red Wing, over the ice on Lake Keuka, near Hammondsport, N.Y.

Mr. J. Newton Williams, who constructed at Hammondsport, N.Y., a full-sized Helicopter to carry a man into the air. (Not a member).

Mr. J.A. Douglas McCurdy, M.E. Toronto University. Assistant Engineer of the A.E.A. Also Treasurer of the Association from the beginning, and Secretary since the death of Lieut. Selfridge. He made the first flight in Canada in a heavier-than-air machine, Feb. 23, 1909, in the Association's Drome No.4, McCurdy's Silver-Dart, over the ice in Baddeck Bay, near Baddeck, Nova Scotia.

Lieut. Thomas E. Selfridge, Military Expert in Aerodromics, who was killed Sept. 17, 1908, in the accident to Orville Wright's flying-machine at Fort Meyer, Va. near Washington, D.C. He was detailed by the U.S. Government to observe the experiments of the A.E.A. at Baddeck, N.S. and Hammondsport, N.Y. in the interests of the U.S. Army, and acted as Secretary of the Association. He made an ascent in the Association's Kite Cygnet I, Dec.6, 1907, over the waters of the Bras d'Or Lake, near Baddeck, Nova Scotia.

(Sitting — left to right)

Dr. Alexander Graham Bell, Chairman of the A.E.A., the only member of the Association who has not been in the air.

Mr. Wm. F. Bedwin, Superintendent of Dr. Bell's Beinn Bhreagh Laboratory, (Not a member).

Mr. Glenn H. Curtiss, Director of Experiments of the A.E.A., and its Chief Executive Officer who made the first measured flight in America in a flying-machine under tests conditions, in the Association's Drome No.3, Curtiss' June Bug, July 4, 1908, when he was warded the Scientific American Trophy by the Aero Club of America.

THE KITE CYGNET I .

3. Kite Cygnet I in the air, towed by the Steamer Blue Hill, near Baddeck, N.S., Dec.4, 1907. The vessel in the picture is the catamaran boat “The Ugly Duckling” from which the Cygnet arose. The Steamer Blue Hill is further to the right beyond the limits of the photograph. This illustrates a preliminary ascension of kite Cygnet I without any man on board.

4. Lieut. Selfridge in the man-hole of Kite Cygnet I Nov. 14, 1907.

5. The Kite Cygnet 1, on board her tender “The Ugly Duckling”, Dec.6, 1907. Lieut. Selfridge, dressed in oil-skin, can be seen sitting on the tilting-frame of the Ugly Duckling.

6. The Kite Cygnet I, on board her tender “The Ugly Duckling”, being towed into position on the Little Bras d'Or Lake by the Steamer Blue Hill, Dec.6, 1907. Lieut. Selfridge can be seen stretched at full length in the man-hole of the Cygnet I.

7. The Kite Cygnet I, on board her tender “The Ugly Duckling”, being towed into position on the Little Bras d'Or Lake by the Steamer Blue Hill, Dec.6, 1907. Photograph taken from the Steamer Blue Hill by Mr. J.G. Davidson.

8. The Kite Cygnet I, carrying Lieut. Selfridge in the man-hole, flying at an elevation of 168 feet over the Little Bras d'Or Lake, near Baddeck, Nova Scotia, Dec. 6, 1907, towed by the Steamer Blue Hill. Photograph taken from the Steamer Blue Hill by Mr. J.G. Davidson.

THE HAMMONDSPORT GLIDER .

? 9. The Hammondsport Glider Feb. 12, 1908.

10. Mr. Glenn H. Curtiss, gliding down hill in the Hammondsport Glider, at Hammondsport, N.Y., Feb. 12, 1908.

DROME NO.I, SELFRIDGE'S RED WING .

11. Drome No.I, Selfridge's Red Wing, on the ice on Lake Keuka, near Hammondsport, N.Y., March 9, 1908. Mr. Wm. F. Bedwin, Superintendent of Dr. Bell's Beinn Bhreagh Laboratory, is holding the machine in position.

12. Drome No.I, Selfridge's Red Wing, on the ice on Lake Keuka, near Hammondsport, N.Y., March 12, 1908. Mr. Glenn H. Curtiss, Director of Experiments of the A.E.A., is in the Aviator's seat.

13. Drome No.I, Selfridge's Red Wing, making its last flight over the ice on Lake Keuka, near Hammondsport, N.Y., carrying Mr. F.W. Baldwin, Chief Engineer of the A.E.A. as aviator March 17, 1908. The photograph shows a lack of lateral stability in the machine. It has tilted over on one side and is sliding down side-ways towards the ice.

14. Drome No.I, Selfridge's Red Wing, making its last flight over the ice on Lake Keuka, near Hammondsport, N.Y., carrying Mr. F.W. Baldwin as Aviator, March 17, 1908. The Red Wing tilted over on one side and struck the ice. The photograph shows the wing piece gradually crushing in, thus acting as a buffer to reduce the shock of landing. The machine was wrecked but the aviator escaped without injury.

DROME NO.2, Baldwin's White Wing .

15. Drome No.2, Baldwin's White Wing at the race-track near Hammondsport, N.Y., May 14, 1908. The lateral stability has been improved by the use of lateral rudders attached to the wing-piece.

16. Drome No.2, Baldwin's White Wing making a flight at the race-track near Hammondsport, N.Y., May 18, 1908, carrying Mr. F.W. Baldwin as Aviator.

DROME NO.3, CURTISS' JUNE BUG .

17. Drome No.3, Curtiss' June Bug at the race- r track near Hammondsport, N.Y., June 21, 1908. The lateral stability has been improved by making the lateral rudders normally horizontal instead of in line with the supporting surfaces.

18. Drome No.3, Curtiss' June Bug, carrying Mr. Glenn H. Curtiss as Aviator, July 1, 1908, at the race-track near Hammondsport N.Y. Photograph taken at dusk by Mr. H. M. Benner of Hammondsport.

19. Drome No.3, Curtiss' June Bug, carrying Mr. Glenn H. Curtiss as Aviator, at the race-track near Hammondsport, N.Y. First flight of July 4, 1908.

20. Drome No.3, Curtiss' June Bug, carrying Mr. Glenn H. Curtiss as Aviator, at the race-track near Hammondsport, N.Y. This was the second flight of July 4, 1908 for which the Scientific American Trophy was awarded by the Aero Club of America.

21. Drome No.3, Curtiss' June Bug, carrying Mr. Glenn H. Curtiss as Aviator, July 10, 1908, near Hammondsport, N.Y.

22. Drome No.3, Curtiss' June Bug, carrying Mr. J.A. Douglas McCurdy as Aviator, at the race-track near Hammondsport, N.Y., July 27, 1908.

23. Drome No.3, Curtiss' June Bug placed upon pontoons and re-named “The Loon”, at Hammondsport, N.Y. Nov. 5, 1908.

24. Drome No.3, Curtiss' June Bug on pontoons and re-named “The Loon” on Lake Keuka, near Hammondsport, N.Y. Nov. 5, 1908.

25. Drome No.3, Curtiss' June Bug on pontoons and re-named “The Loon”, propelled over the water on Lake Keuka, near Hammondsport, N.Y., carrying Mr. Douglas McCurdy as Aviator, Nov. 30, 1908. “The Loon” did not rise into the air.

DROME NO.4, McCURDY'S SILVER-DART .

26. Drome No.4, McCurdy's Silver-Dart at the race-track near Hammondsport, N.Y., Nov.3, 1908.

27. Drome No.4, McCurdy's Silver-Dart, at the race-track near Hammondsport, N.Y., carrying Mr. J.A. Douglas McCurdy as Aviator, Dec.13, 1908.

28. Drome No.4, McCurdy's Silver-Dart, carrying Mr. J. A. Douglas McCurdy as Aviator, over the ice on Baddeck Bay, near Baddeck, Nova Scotia, Feb.24, 1909.

29. Drome No.4, McCurdy's Silver-Dart, carrying Mr. J.A. Douglas McCurdy as Aviator, over the ice on Baddeck Bay, near Baddeck, Nova Scotia, March 8, 1909. This photograph shows Mr. McCurdy passing the old McCurdy Homestead where he lived as a boy.

30. Drome No.4, McCurdy's Silver-Dart, carrying Mr. J. A. Douglas McCurdy as Aviator, over the ice in the Harbor at Baddeck, Nova Scotia, March 8, 1909.

1 142700-A 2 neg 137689-A

DR. A.G. BELL, MR. I NEWTON WILLIAMS, CAPT. T.S. BALDWIN, MR. G.H. CURTISS, MR. J.A.D McCURDY, AND MR. W.F. BEDWIN, NEAR AERODROME SHED AT HAMMONDSPORT, N.Y., APRIL 6, 1908.

3 42689? Book II

KITE CYGNETI, IN THE AIR, TOWED BY THE STEAMER BLUE HILL, NEAR BADDECK N.S. DEC. 4, 1907. THE VESSEL IN THE PICTURE IS THE UGLY DUCKLING FROM WHICH THE CYGNET AROSE.

4 1392?5-A

79 taken 1907 Dec. 1907 LIEUT, SELFRIDGE IN THE MANHOLE OF THE KITE CYGNET, NOV. 14, 1907.

5

NETI, ON BOARD HERTENDER THE UGLY DUCKLING, DECEMBER, 1909 LIEUT. SELFRIDGE DRESSED IN OIL-SKIN, CAN GETTING ON TESTING FRAME OF THE UGLY DUCKLING BERKS

KITE CYGNETI, ON BOARD THE UGLY DUCKLING, BEING TOWED INTO POSITION OVER THE LITTLE BRASDOR LAKE BY THE STEAMER BLUE HILL, DEC. 6, 1907. LIEUT. SELFRIDGE CAN BE SEEN STRETCHED AT FULL LENGTH IN THE MANHOLE OF THE CYGNET.

7

KITE CYGNETI, WITH LIEUT. SELFRIDGE ON BOARD, ON HER TENDER THE UGLY DUCKLING. BEING TOWED UNTO POSITION FOR AN ASCENSION DEC. 6, 1907, ON THE LITTLE BRASDOR LAKE, NEAR BADDECK NOVA SCOTIA. AND TO TAKEN FROM STEAMER BLUEHILL BY MR. J.G. DAVIDSON.

8

, WITH LIEUT. SELFRIDGE ON BOARD, FLYING OVER THE LITTLE BRASDOR LAKE, NEAR BADDECK, NOVA SCOTIA, DEC. 6, 1907. PHOTO TAKEN FROM THE STEAMER BLUEHILL BY MR. J.G. DAVIDSON.

9 Taken Feb. 12 08 37662-A

THE HAMMONDSPORT GLIDER, FEB. 12, 1908.

10 137667-A3??

MR. GLENN H. CURTISS GLIDING DOWN HILL IN THE HAMMONDSPORT GLIDER AT HAMMONDSPORT, N.Y. FEB. 13, 1908.

11 137672-A B III p 122

DROME NO. I, SELFRIDGE'S RED-WING, AT HAMMONDSPORT, N.Y, MARCH 9, 1908.

12 137642 A

DROME NO. I, SELFRIDGE'S RED WING, WITH MR. GLENN H. CURTISS ON BOARD, ON THE ICE ON LAKE KEUKA, NEAR HAMMONDSPORT, N.Y. MARCH 12, 1908.

13

DROME NO. I, SELFRIDGE'S RED WING FLYING OVER THE ICE ON LAKE KEUKA NEAR HAMMONDSPORT, N.Y. CARRYING MR. F. W. BALDWIN AS AVIATOR ON MARCH 17, 1908. TAKEN IMMEDIATELY BEFORE CATASTROPHE WHICH WRECKED THE MACHINE BUT LEFT THE AVIATOR UNINJURED.

14 137684-A B III, p. 127

DROME NO I. SELFRIDGE'S RED WING ON THE ICE LAKE KEUKA NEAR HAMMONDSPORT, N.Y., CARRYING MR. F. W. BALDWIN AS AVIATOR. THE RED WING STRUCK THE ICE ON ONE WING AND WAS WRECKED THE PHOTO SHOWS THE WING-PIECE CRUSHING IN. THUS ACTING AS A BUFFER TO REDUCE THE SHOCK TO THE AVIATOR. THE MACHINE WAS DESTROYED, BUT MR. BALDWIN ESCAPED WITHOUT INJURY. PHOTO TAKEN MARCH 17, 1908

15 137613-A

DROME NO. 1, BALDWIN'S WHITE-WING, AT HAMMONDSPORT, N.Y. MAY 14, 1908.

16

DROME NO. 1, BALDWIN'S WHITE WING CARRYING MR. F. W. BALDWIN AS AVIATOR MAY 18, 1908 AT HAMMONDSPORT, N.Y.

DROME NO 3, CURTISS' JUNE BUG, AT HAMMONDSPORT, N.Y. JUNE 21, 1908.

18 137723-A III

DROME NO. 5 CURTISS JUNE BUG, CARRYING MR. GLENN H. CURTISS AS AVIATOR, JULY 1, 1908, AT HAMMONDSPORT, N.Y. PHOTO TAKEN

19

DROME NO. 3 CURTISS JUNE BUG, CARRYING MR. GLENN H. CURTISS AVIATOR AT THE

20 Neg #137730-A

JUNE BUG CARRYING MR. GLENN H. CURTISS AVIATOR JULY 4, AT HAMMONDSPORT ON THE SCIENTIFIC AMERICAN TROPHY BY FLYING

21 22

DROME NO.3 CURTISS' JUNE BUG, CARRYING MR.DOUGLASS McCURDY, AS AVIATOR, AT HAMMONDSPORT, N.Y. JULY 27, 1908

23

DROME NO.3 CURTISS' JUNE BUG PLACED ON PONTOONS AND RENAMED THE LOON ON LAKE KEUKA, HAMMONDSPORT, N.Y. NOV.5, 1908

24

DROME NO.3.CURTISS' JUNE BUG ON PONTOONS AND RENAMED THE LOON AT HAMMONDSPORT, N.Y. NOV.5, 1908

25

DROME NO.3.CURTISS' JUNE BUG, PLACED UPON PONTOONS AND RE-NAMED THE LOON, PROPELLED OVER THE WATER ON LAKE KEUKA NEAR HAMMONDSPORT, N.Y, CARRYING MR.DOUGLAS McCURDY AS AVIATOR, NOV.30,1908. THE LOON DID NOT RISE INTO THE AIR

26

DROME NO 4,McCURDY'S SILVER-DART AT HAMMONDSPORT,N.Y. NOV.3, 1908.

27

DROME NO 4,McCURDYS SILVER-DART,CARRYING MR.DOUGLAS McCURDY AS AVIATOR AT HAMMONDSPORT,N.Y.

28 130728-A III. p 140 as date

DROME NO.4,McCURDY'S SILVER-DART,CARRYING MR.DOUGLAS McCURDY AS AVIATOR, OVER THE ICE ON BADDECK BAY BADDECK, N.S. FEB.24, 1999.

29

DROME NO4,MCCURDYS SILVER-DART,CARRYING MR.DOUGLAS MCCURDY AS AVIATOR OVER THE ICE ON BRODECK BAY MARCH 8, 1909

30

DROME NO.4,McCURDY'S SILVER-DART,CARRYING MR.DOUGLAS McCURDY AS AVIATOR, OVER THE ICE IN THE HARBOR AT BADDECK, NOVA SCOTIA, MARCH 8, 1909.

31

SIDE VIEW OF CYGNEID, TAKEN ON ICE IN BADDECK BAY, FEB. 25, 1909.